SPECIFICATIONS & CONTRACT DOCUMENTS

GADSDEN SPORTS PARK - PHASE 2

BID REQUEST NO. 3464

CITY OF GADSDEN, ALABAMA

BID DATE
DECEMBER 7, 2021

SHERMAN GUYTON
MAYOR

HEATH WILLIAMSON
DIRECTOR OF ENGINEERING

PREPARED BY:

CITY OF GADSDEN
ENGINEERING DEPARTMENT

BIDS SUBMITTED TO:
IVA NELSON
CITY CLERK

GADSDEN SPORTS PARK - PHASE 2
SPECIFICATIONS AND CONTRACT DOCUMENTS
CITY OF GADSDEN, ALABAMA

CIVIL SPECIFICATIONS

02324 UTILITY TRENCHING
02325 DEWATERING
02371 RIPRAP AND ROCK LINING
02374 EROSION CONTROL DEVICES
02512 SITE WATER DISTRIBUTION
02515 WATER SERVICE CONNECTIONS
02535 GRAVITY SANITARY SEWER SYSTEM
02630 SITE STORM DRAINAGE
02721 AGGREGATE BASE COURSE
02740 FLEXIBLE PAVEMENT
02763 PAINTED PAVEMENT MARKINGS
02910 ATHLETIC FIELD ROOT ZONE AND DRAINAGE
02924 SEEDING AND SOIL SUPPLEMENTS
02926 ATHLETIC FIELD SODDING AND MAINTENANCE

DIVISION 3- CONCRETE
03200 CONCRETE REINFORCEMENT
03300 CAST-IN-PLACE CONCRETE

ARCHITECTURAL SPECIFICATIONS

01236 CONCRETE COUNTERTOPS
01330 SUBMITTALS
01500 TEMPORARY FACILITIES
01770 CONTRACT CLOSEOUT
01900 WARRANTIES
02830 FENCING
02938 NON-ATHLETIC SODDING
03284 IRRIGATION
03292 HYDROSEEDING
03293 LANDSCAPE PLANTING
03354 POLISHED CONCRETE FLOOR
04200 UNIT MASONRY
05500 MISCELLANEOUS METALS
06100 ROUGH CARPENTRY
06400 ARCHITECTURAL WOODWORK
07210 INSULATION
07411 METAL ROOF PANELS
07620 SHEET METAL FLASHING AND TRIM
07920 JOINT SEALANTS
08110 HOLLOW METAL DOORS AND FRAMES
08330 OVERHEAD DOOR
08551 CLAD WOOD WINDOWS
08710 DOOR HARDWARE
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09250 GYPSUM BOARD
09512 LAY-IN CEILINGS
09650 RESILIENT FLOORING
09900 PAINTING
10155 TOILET PARTITIONS
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10522 FIRE EXTINGUISHERS
10750 FLAGPOLES
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MECHANICAL SPECIFICATIONS

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15140 SUPPORTS AND ANCHORS
15256 INSULATION FOR CONDENSATE DRAINS
15258 DUCTWORK INSULATION
15264 INSULATION FOR PLUMBING SYSTEMS
15268 INSULATION FOR REFRIGERANT PIPING
15400 PLUMBING SYSTEM
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15981 TESTING, ADJUSTING, AND BALANCING

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26 01 01 BASIC ELECTRICAL REQUIREMENTS
26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 09 23 LIGHTING CONTROL DEVICES
26 22 00 LOW-VOLTAGE TRANSFORMERS
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 43 13 SURGE PROTECTION FOR LOW VOLTAGE ELECTRICAL POWER CIRCUITS
26 51 00 INTERIOR LIGHTING
26 56 00 EXTERIOR LIGHTING
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SUPPLEMENTAL GEOTECHNICAL TEST PITS

INSURANCE ATTACHEMENTS
- GENERAL LIABILITY SAMPLE
- OCP SAMPLE

NOTICE TO CONTRACTORS

Bidders shall prequalify for this project. Prequalification proposals for General Contractors will be received at the office of the City Clerk, City of Gadsden, Alabama, located on the 4th floor of City Hall, 90 Broad Street, Gadsden, Alabama until 2:00 P.M., Friday, November 19, 2021. Prequalification forms and criteria shall be obtained from the City of Gadsden Engineering Department by email request to hwilliamson@cityofgadsden.com. No verbal requests will be accepted. All approved bidders will be notified by Monday, November 22, 2021.

A Mandatory Attendance Pre-Bid Meeting will be held on-site at the Gadsden State Community College Sports Complex on Tuesday, November 30, 2021, at 2 PM. The main campus address is 1001 George Wallace Drive, Gadsden, AL 35903. All Pre-Qualified bidders shall have a representative present at the meeting in order to remain on the approved bidders list.

Sealed construction proposals will be received by the City Clerk, City of Gadsden, Alabama, at the City Hall, 90 Broad Street, Room 411, Gadsden, Alabama until 2:00 P.M., Tuesday, December 7, 2021, for furnishing all labor, materials, equipment, and service required to complete the Gadsden Sports Park – Phase 2, Bid Request No. 3464, located in the City of Gadsden, Alabama.

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

Bids will be publicly opened and read at the above time and place. Plans, Specifications, and Contract Documents are open to the public for inspection at the City Hall. Electronic (pdf) Plans, Specifications, and Contract Documents may be obtained from the City of Gadsden Engineering Department, Room 301, City Hall, 90 Broad Street, Gadsden, Alabama by calling (256)-549-4520, All bidders must be registered with the City of Gadsden Engineering Department in order to submit a bid. Bids received from unregistered bidders will be rejected.

The bidder shall file with his bid either a cashier's check drawn on an Alabama bank, payable to the City of Gadsden, Alabama, or a bid bond executed by a surety company duly authorized and qualified to make such bonds in Alabama, in an amount equal to the lesser of five percent (5%) of the bid or ten thousand ($10,000).

The apparent low bidder will be required to submit their list of subcontractors within two days of the bid opening date to confirm compliance with the experience and qualification requirements listed in the technical specifications of each applicable trade before being considered for award

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

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

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

Any bidder, whether a resident or non-resident of the State of Alabama, must comply with all applicable provisions of Section 34-8-1, et. seq., Code of Alabama, 1975, including requirements for licensing as a general contractor and the necessity to show evidence of license, before the bid will be considered by the awarding authority. A current license number must be included on the bid in accordance with section 102.1 of the bid documents.

Bidders must comply with the President's Nos. 11246 and 11375 which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must also comply with Title IV of the Civil Rights Act of 1964, Title VIII of the Civil Rights Act of1968, and Section III of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 170lu.

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

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

THE CITY GADSDEN, ALABAMA
Sherman Guyton, Mayor

Iva Nelson, City Clerk

DIVISION 102

INSTRUCTIONS TO BIDDERS

102.1 PROPOSALS

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

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

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

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

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

f. **The apparent low bidder will be required to submit their list of subcontractors within two days of the bid opening date to confirm compliance with the experience and qualification requirements listed in the technical specifications of each applicable trade before being considered for award**. **Refer to Section 105.4, "Subcontracts" for additional information.**

102.2 INTERPRETATIONS

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

102.3 ALTERNATE BIDS

The bid contains no alternates.

102.4 BID SECURITY

a. The bid must be accompanied by a bid guaranty which shall be equal to the lesser of five percent (5%) of the amount of the bid or ten thousand dollars ($10,000), and at the option of the bidder, may be a cashiers check or a bid bond secured by a guaranty company or a surety company in the form attached. No bid will be considered unless it is so guaranteed. Cashiers checks must be made payable to the order of the Owner. Cash deposits will not be accepted. The bid guaranty shall insure the execution of the contract and the furnishing of performance and payment bond or bonds by the successful bidder all as required by the Specifications.

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

102.5 COLLUSIVE AGREEMENTS

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

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

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

102.6 CORRECTIONS

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

102.7 TIME FOR RECEIVING BIDS

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

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

102.8 OPENING OF BIDS

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

102.9 WITHDRAWAL OF BIDS

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

102.10 AWARD OF CONTRACT; REJECTION OF BIDS

a. The Contract will be awarded to the responsible bidder submitting the lowest proposal complying with the conditions of the Invitation for bids provided the bid is reasonable and it is to the interest of the owner to accept it. The Owner will review the base bid only, plus each individual additive alternate to determine whether the award will be made to include the base bid only or the base bid plus any of the additive alternates in the succession given on the bid schedule. The additive alternate order will not be rearranged. The bidder to whom the award is made will be notified at the earliest practicable date. The Owner, however, reserves the right to reject any and all bids and to waive any informality in bids received whenever such rejection or waiver is in the interest of the Owner.

b. The Owner also reserves the right to reject the bid of any bidder who has previously failed to perform properly, or to complete contracts on time, who is not in a position to perform the

contract, or who has disregarded his obligations to subcontractors, material men or employees. In determining the lowest responsible bidder, the following elements, in addition to those mentioned above, will be considered; whether the bidder involved (1) maintains a permanent place of business; (2) has adequate plant equipment available to do the work properly and expeditiously; (3) has suitable financial resources to meet the obligations incident to the work; (4) has appropriate technical experience; (5) has defaulted under previous contracts; (6) has failed to pay or settle bills due for labor and material on former contracts in force at the time of issuance of proposals.

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

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

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

b. After satisfying all conditions required for awarding the contract, as set forth in these documents, the successful bidder shall, within ten days, furnish a Performance Bond on the form included in the proposal in an amount equal to one hundred percent (100%) of the contract bid price of the contract as awarded. The successful bidder shall also furnish a Labor and Material Bond in an amount not less than 100% of the contract bid price, with the obligation that the contractor shall within ten days make payment to all persons, firms or corporations to whom the contractor may become legally indebted for labor, materials, services and equipment used in the prosecution of the work, or for the payment of reasonable attorney's fees incurred by successful claimants or plaintiffs in suits on said bonds.

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

DIVISION 103

BID SPECIFICATIONS

CHECKLIST FOR REQUIRED DOCUMENTS TO BE SUBMITTED AT BID

- ❒ BID FORM
- ❒ BID BOND
- ❒ NON-COLLUSION AFFIDAVIT OF PRIME BIDDER
- ❒ EQUAL OPPORTUNITY REPORT STATEMENT
- ❒ CONTRACTOR'S CERTIFICATION OF NONSEGREGATED FACILITIES

These documents shall be included and executed properly in the bid package or the bid submitted will not be considered by the awarding authority.

_____
Company Name
(Please Print Or Type)

BID SPECIFICATIONS

BID FORM

BID NO. 3464 FOR THE CONSTRUCTION OF THE GADSDEN SPORTS PARK - PHASE 2 FOR THE CITY OF GADSDEN, ALABAMA. THE PROJECT SHALL BE BID IN ACCORDANCE WITH THE BREAKDOWN FOR THE ITEMS SHOWN BELOW AND ON PROJECT PLANS.

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

City Officials:

103.1 The undersigned, having examined and become familiar with the local conditions affecting the cost of the work and with the Specifications (including Invitations for Bids, Instructions to Bidders, This Bid, the Form of Bid Bond, Statements of Bidder's Qualifications and Form of Contract, the Form of Non-Collusion Affidavit, the Form of Performance Bond and Labor and Material Bond and the Technical Specifications) and addenda numbered _____ to _____, as prepared by the City of Gadsden Engineering Department, Gadsden, Alabama, and on file in the office of the Director of Engineering of the City of Gadsden, Alabama, The City Hall, Gadsden, Alabama, hereby proposes to furnish all labor, materials, equipment, and services required to construct and complete "Gadsden Sports Park - Phase 2". Due to the nature of work on this project, all items of work will be let in one contract or as separate proposals, whichever is applicable.

_____
Company Name
(Please Print Or Type)

QUANTITES

GADSDEN SPORTS PARK, PHASE 2

BASE BID ITEMS

ITEM	QTY	UNIT	DESCRIPTION	UNIT COST	BID AMOUNT
-	-	-	-	-	-
1	1	LS	Mobilization (Maximum 5% of Base Bid)		
2	1	LS	Geometric Controls		
3	1	LS	Demolition		
4	1	LS	Clearing and Grubbing		
5	1	LS	Site Grading		
6	12000	CY	Muck Excavation (Loose Truck Bed Measurement)		
7	12000	CY	Borrow Excavation (Loose Truck Bed Measurement)		
8	276	Ton	Bituminous Paving Wearing Layer 165 LB/SY		
9	460	Ton	Bituminous Paving Binder Layer 275 LB/SY		
10	5	Ton	Bituminous Paving Patching Layer 450 LB/SY		
11	2600	Ton	ALDOT 825, Type B (Misc. Use)		
12	2100	Ton	ALDOT No. 57 or 78 Crushed Stone (Misc. Use)		
13	1	LS	Pavement Striping and Markings		
14	1	LS	Parking & Crosswalk Signage		
15	1165	LF	18" Combination Curb and Gutter		
16	5	EA	Concrete Parking Bumper		
17	30	LF	Concrete Flume		
18	580	SY	4" Concrete Sidewalk		
19	22	SF	Truncated Domes for ADA Ramps		
20	4790	SY	6" Concrete Pavement		
21	180	LF	8" HDPE Storm Pipe		

_____
Company Name
(Please Print Or Type)

22	900	LF	12" HDPE Storm Pipe		
23	960	LF	15" HDPE Storm Pipe		
24	570	LF	18" HDPE Storm Pipe		
25	340	LF	24" HDPE Storm Pipe		
26	21	EA	HDPE Drain Basin w/Grate Inlet or Solid Lid		
27	3	EA	Concrete Junction Box w/ Grate Inlet or Solid Lid		
28	7	EA	Open Throat Inlet		
29	3	EA	Concrete Slope Paved Headwall		
30	1	EA	Domestic Water Connection (6" Tapping Sleeve and Valve)		
31	270	LF	6" CL 350 DI Water Main (Including Fittings)		
32	1	EA	6" Gate Valve and Box		
33	1	LS	4" Service Connection with 4" Irrigation Meter Vault		
34	1	LS	4" Double Check Backflow Assembly Vault		
35	1	EA	2" Service Connection with 2" Meter Vault		
36	370	LF	2" Municipex Service Tubing		
37	255	LF	3/4" Muncipex Service Tubing		
38	445	LF	6" SDR-26 PVC Gravity Sewer Lateral		
39	4	EA	6"x4" Clean-out		
40	1	EA	Connection to Existing Sanitary Sewer		
41	1	LS	Erosion Control		
42	1	LS	Infield and Outfield Playing Surface and Drainage		
43	4700	SY	Bermuda Sod (Outside of Athletic Fields)		
44	20600	SY	Permanent Seeding		
45	1	LS	Irrigation (Outside of Athletic Fields)		
46	1	LS	Press Box Renovation		
47	1980	LF	Chain Link Fencing-4' Height		

_____
Company Name
(Please Print Or Type)

48	2625	LF	Chain Link Fencing-8' Height		
49	430	LF	Backstop Wall		
50	1	LS	Backstop Netting System		
51	8	Each	Bullpen		
52	1	LS	Batting Cage System		
53	6	Each	New Dugout		
54	2	Each	Repair Existing CMU Dugout		
55	8	Each	Bleachers		
56	1	LS	Athletic Field Accessories		
57	1	LS	Electrical & Lighting		
58	1	LS	Contingency	$200,000.00	$200,000.00
			TOTAL BASE BID AMOUNT		

ADDITIVE ALTERNATE BID ITEMS

ITEM	**QTY**	**UNIT**	**DESCRIPTION**	**UNIT COST**	**BID AMOUNT**
A1	1	LS	Shade Sails		
A2	1	LS	Landscaping		
A3	8	Each	Alternate Dugout		

_____
Company Name
(Please Print Or Type)

BID SPECIFICATIONS

Please note bid number on outside of sealed envelope.

Note: Any alteration of the bid sheet may result in disqualification of the bid.
Note: Performance and Labor and Material Bond shall be based on the preceding total amount.

In submitting this bid, it is understood that the right is reserved by the City of Gadsden, Alabama to reject any and all bids. If written Notice of Acceptance of this bid is mailed to the undersigned within sixty (60) days after the opening thereof, or any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bonds within ten (10) days after the contract is presented to him for signature.

103.3 Security in the sum of

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

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

Date:_____ _____
Contractor

OFFICIAL ADDRESS

_____ By:_____

_____ Title:_____

Ala. License No._____

Federal Tax ID No._____

Phone No._____

Fax No._____

_____
Company Name
(Please Print Or Type)

BID SPECIFICATIONS

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we the Undersigned

_____
as PRINCIPAL, and _____, as SURETY are held and firmly bound unto the City of Gadsden, Alabama herein-after called the "City of Gadsden", in the penal sum of_____
_____Dollars lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, That whereas the principal has submitted the accompanying bid, dated_____, 20____, for_____
_____

NOW THEREFORE, if the Principal shall not withdraw said bid after the opening of the same, and shall within the period after the prescribed forms are presented to him for signature, enter into a written contract with the City of Gadsden in accordance with the bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract; or in the event of the failure to enter into such contract and given such bond within the time specified, if the Principal shall pay the City of Gadsden, the difference between the amount specified in said bid and the amount for which the City of Gadsden may procure the required work or supplies or both, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this _____day of_____, 20____, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representatives, pursuant to authority of its governing body.

IN PRESENCE OF:

_____ _____(SEAL)
Individual Principal

_____ _____
Business Address

_____ _____(SEAL)
Individual Principal

_____ _____
Business Address

_____
Company Name
(Please Print Or Type)

Attest:

_____ _____
Corporate Principal
_____
Business Address

By_____(SEAL)*

Attest:

_____ _____
Corporate Surety

_____
Business Address

By_____(SEAL)*

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

*Affix corporate seals.

CERTIFICATE AS TO CORPORATE PRINCIPAL

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

_____(SEAL)*

_____
Company Name
(Please Print Or Type)

BID SPECIFICATIONS

STATEMENT OF BIDDER'S QUALIFICATIONS

(General Contractor)

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

1. Name of bidder.
2. State License #
3. Permanent main office address.
4. When organized.
5. Where incorporated.
6. How many years have you been engaged in the contracting business under your present firm name?
7.* Contracts on hand: (Schedule these, showing gross amount of each contract and the approximate anticipated dates of completion.)
8.* General character of work performed by your company.
9. Have you ever failed to complete any work awarded to you? Please explain.
10.* Have you ever defaulted on a contract? Please explain.
11.* List the projects completed by your company within the last two years stating approximate cost for each, and the month and year completed.
12.* List your major equipment to be used on this contract.
13.* Background and experience of the principal members of your personnel, including the officers.
14.* Credit available; furnish written evidence.
15. Proof of enrollment in the E-Verify system.

*If necessary, attach separate sheets for these items.

BID SPECIFICATIONS

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF _____

COUNTY OF _____

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

(5) He is _____of _____
(Owner or Partner or Officer) (Firm)

_____, The Bidder that has submitted the attached Bid;

(5) He is fully informed respecting the preparation and contents of the attached Bid and of all circumstances respecting such Bid;

(6) Such Bid is genuine and is not collusive or sham Bid;

(5) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Local Authority or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

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

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

(Notary Public)_____
My Commission Expires _____, _____

BID SPECIFICATIONS

EQUAL OPPORTUNITY REPORT STATEMENT

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

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

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

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

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

_____
Name of Bidders

By_____

Title_____

Business Address:_____

_____

Contractor's License No._____

BID SPECIFICATIONS

WAGE, LABOR, AND EQUAL EMPLOYMENT OPPORTUNITY

CONTRACTORS CERTIFICATION OF NONSEGREGATED FACILITIES

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

_____

Date_____

DIVISION 104

CONTRACT

CONTRACT

THIS AGREEMENT made this the _____, day of _____, 2021, by and between _____, herein called the "Contractor" and the City of Gadsden, Alabama, a Municipal Corporation, hereinafter called the "Owner".

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

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

SPECIFICATIONS & CONTRACT DOCUMENTS
GADSDEN SPORTS PARK - PHASE 2
BID REQUEST NO. 3464
DECEMBER 7, 2021

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

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

TOTAL CONTRACT PRICE $_____

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

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

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

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

_____
Contractor

WITNESS

_____ By_____

_____ Title_____

Address_____

_____

THE CITY OF GADSDEN, ALABAMA

WITNESS

_____ _____
Sherman Guyton, Mayor

_____

CERTIFICATIONS

I, _____, certify that I am the _____

of the corporation named as Contractor herein; that _____, who signed this

Contract on behalf of the Contractor was then _____, of said Corporation, that

said Contract was duly signed for and in behalf of said corporation by authority of its governing body and is

within the scope of its corporate powers.

_____(SEAL)*

_____

_____

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

_____(SEAL)*
Iva Nelson, City Clerk

(Print or type the names underneath all signatures.)

*(Affix corporate seal where marked (SEAL).

STATE OF ALABAMA
COUNTY OF ETOWAH

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

Given under my hand on _____, 2021.

_____

Notary Public

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we_____

_____

hereinafter called the Principal, and _____

_____

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

_____

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

WHEREAS, the Principal has entered into a contract with the City of Gadsden, dated _____, 2021 for _____

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

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

NOW, THEREFORE, the conditions of this obligation are such that the Principal shall in all respects fully comply with the terms and conditions of said contract and his obligations thereunder, including the specifications and proposals therein referred to and made a part thereof and such alterations as may be made on such specifications as therein provided for, and shall indemnify and save harmless the City of Gadsden against or from all costs, expenses, damages, injury or loss, to which the City of Gadsden may be subjected by reason of any doing wrong, misconduct, want of care or skill, negligence, or default, including patent infringement, on the part of the Contractor, his agents, or employees, in the execution or performance of said Contract, and shall promptly pay all just claims for damages or injury to property and for all work done, or skill, tools, machinery, supplies, labor and materials furnished and debts incurred by the Contractor in or about the performance of the work contracted for, this obligation is to be void.

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

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

IN TESTIMONY WHEREOF, The Principal and the Surety have caused these presents to be duly signed and sealed on this _____day of _____, 2021.

IN PRESENCE OF:

_____ _____(SEAL)*
Individual Principal

_____ _____
Business Address

_____
Corporate Principal

ATTEST:

_____ By_____(SEAL)*

_____
Business Address

_____
Corporate Surety

ATTEST:

_____ By_____(SEAL)*

_____
Business Address

_____

*Affix Corporate Seals

CERTIFICATE AS TO CORPORATE PRINCIPAL

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

_____(SEAL)*

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

Total amount of premium charged, $_____.

NOTE: The above must be filled in by Corporate Surety

*Affix corporate seal.

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____

_____

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

_____

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

WHEREAS, the Principal has entered into a contract with the City of Gadsden, dated _____, 2021 for_____

_____

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

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

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

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

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

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

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

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

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

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

IN TESTIMONY WHEREOF, the Principal and the surety have caused these presents to be duly signed and sealed on the _____ day of _____, 2021.

IN PRESENCE OF:

_____ _____
Individual Principal

_____ _____
Business Address

ATTEST:

_____ _____
(Corporate Principal)

By_____(SEAL)*

_____
(Business Address)

_____
(Corporate Surety)

ATTEST: By_____(SEAL)*

_____ _____
(Business Address)

*Affix corporate seals.

CERTIFICATE AS TO CORPORATE PRINCIPAL

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

_____(SEAL)*

The rate of premium on this bond is _____per thousand.

Total amount of premium charged, $_____.

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

DIRECTIONS FOR PREPARATION OF PERFORMANCE AND LABOR AND MATERIAL BONDS

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

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

3. The penal sum shall be not less than that required by the Specification.

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

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

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

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

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

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

   (a) The rate of premium in dollars per thousand; and

   (b) The total dollar amount of premium charged.

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

11. Type or print the name underneath each signature appearing on the bond.

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

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

_____ _____

_____ _____

_____ _____

CONTRACT PROVISION

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

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

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

_____

Date:_____

CERTIFICATION OF CONTRACT

DATE: _____

CONTRACT: **Gadsden Sports Park - Phase 2**

Owner:

PARTIES: **City of Gadsden**

Contractor:

_____

BID NO. **3464**

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

_____
Sherman Guyton, Mayor

_____
Date

CERTIFICATE OF OWNER'S ATTORNEY

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

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

_____
City Attorney

_____
Date

DIVISION 105

GENERAL CONDITIONS

105.1 DEFINITIONS

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

a. The "Contract" means the contract executed by the Owner and the Contractor, of which these General Conditions form a part. The documents which comprise the contract are set forth in the contract form.

b. The terms "Owner" and "Contractor" mean the respective parties to the contract.

c. The "Engineer" is the Director of Engineering of the City of Gadsden, Alabama, or his duly authorized representative.

d. The term "Project" means the construction work for which is contemplated in whole or in part under this contract.

e. The term "Specifications" means the volume which includes, the Instructions and Forms (Invitation for Bids, Instructions to Bidders, Bid, Bid Bond, non-Collusive Affidavit, Statement of Bidder's Qualifications, Contract and Performance and Payment of Bond or Bonds), the General Specifications (consisting of the General Conditions, the Special Condition, and the General Scope of Work) and the Technical Specifications.

105.2 CONTRACTOR

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

105.3 SUPERINTENDENCE BY CONTRACTOR

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

105.4 SUBCONTRACTS

a. The Contractor shall not award any work to any Sub-Contractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to it a written statement containing such information as the Owner may require concerning the proposed Sub-Contractor's noncollusion affidavit in the following form:

The apparent low bidder will be required to submit their list of subcontractors within two days of the bid opening date to confirm compliance with the experience and qualification requirements listed in the technical specifications of each applicable trade before being considered for award.

At a minimum, each sub-contractor shall have been in business (under the same name and principal control) a minimum of 5 years prior to date of opening bids and shall have past experience in the types of work involved in this project, have all up to date certifications when applicable, and be regularly engaged in all the applicable types of work. Documentation shall be provided on past projects with references and contact information for at least three projects of similar type, size, and scope. Should the individual spec sections contain more stringent requirements, specs govern. Should the specs contain less stringent requirements, Section 105.4 governs.

More stringent qualification requirements exist for (not all-inclusive list):

i. Athletic Field Subcontractor
ii. Electrical Subcontractor

NON-COLLUSION AFFIDAVIT OF SUBCONTRACTOR

STATE OF _____

COUNTY OF _____

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

(1) He is _____of _____
(Owner or Partner or Officer) (Firm)

_____, The Bidder that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all circumstances respecting such Bid;

(3) Such Bid is genuine and is not collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Local Authority or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

_____
(Signed)

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

(Notary Public)_____
My Commission Expires _____, _____

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

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

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

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

f. LIMITATIONS: The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or contracts or any portion thereof, or of his right, title, or interest therein, without written consent of the Engineer. Any items designated in the contract as "specialty items" may be performed by sub-contract and the cost of any such specialty items performed by contract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his own organization. No subcontracts or transfer of contract shall relieve the Contractor of his liability under the contract and bonds.

105.5 OTHER CONTRACTS

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

105.6 FITTING AND COORDINATION OF THE WORK

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

105.7 MUTUAL RESPONSIBILITY OF CONTRACTORS

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

pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith.

105.8 PAYMENTS TO CONTRACTOR

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

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

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

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

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

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

105.9 CHANGES IN THE WORK

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

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

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

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

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

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

d. Under Method (1) & (3), for extra work performed, the allowances for overhead and profit combined, included in the total cost to the Owner shall not exceed fifteen percent (10%) of the Contractors net additional cost. There shall be no additional cost added under method (2).

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

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

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

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

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

105.10 CLAIMS FOR EXTRA COST

a. If the Contractor claims that any instructions involve extra cost or extension of time, he shall, within ten days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the Engineer stating clearly and in detail the basis of his objections. No such claim shall be valid unless so made.

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

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

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

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

105.11 RIGHT OF OWNER TO TERMINATE CONTRACT

If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or fail to supply enough properly skilled workmen or proper materials, or if he should fail to make prompt payment to his employees or to his Sub-Contractors, or persistently disregard instructions of the Owner or Engineer or fail to observe or perform the provisions of the Contract, or otherwise be guilty of

substantial violation of any provision of the Contract, then the Owner may, by at least five days prior written notice to the Contractor, without prejudice to any other rights or remedies of the Owner, terminate the Contractor's right to proceed with the work. In such event, the Owner may take over and prosecute the work to completion, by contract or otherwise and the Contractor and his sureties shall be liable to the Owner for any excess cost occasioned the Owner thereby. In any such case the Owner may take possession of and utilize in completing the work such materials, appliance, and plant as may be on the site of the work and necessary therefore. The foregoing provisions are in addition to, and not in limitation of the Owner's rights under any other provisions of the Contract.

105.12 DELAYS - DAMAGES

a. If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in the Special Conditions, Division 106, or any extension thereof, or fails to complete said work within such times, the Owner may by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Owner may take over the work and prosecute the same to completion, by contract or otherwise and the Contractor and his sureties shall be liable to the Owner for any excess cost occasioned the Owner thereby. If the Contractor's right to proceed is so terminated, the Owner may take possession of and utilize in completing the work such materials, appliances and plant as may be on the site of the work and necessary therefore. Until such time as the Owner terminates the right of the Contractor to proceed, the Contractor shall continue the work, and the Contractor shall pay to the Owner as fixed, agreed and liquidated damages (it being impossible to determine the actual damages occasioned by the delay) for each calendar day of delay until the work is completed, or accepted, or until such time as the Contractor's right to proceed shall be terminated, the amount as set forth in the Special Conditions, and the Contractor and his sureties shall be liable for the amount thereof. In the event the Owner shall at any time subsequent to the date of completion, as established in the Contract or any amendment thereto, terminate the Contractor's right to proceed, such termination shall not relieve the Contractor of the payment of the liquidated damages which have accrued from the completion date as established in the Contract, up to and including the date of the termination of the Contractor's right to proceed. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages because of any delays in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to acts of God, or of the public enemy, acts of the Government, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantines, restrictions, strikes, freight embargoes, and unusually severe weather or delays of Sub-Contractors due to such cause, if the Contractor shall within ten (10) days from the beginning of any such delay notify the Engineer in writing of the causes of delay, the Engineer shall ascertain the facts and the extent of delay. The Owner shall extend the time for completing the work when in its judgment the findings of facts of the Engineer justify such an extension, and his findings of fact thereon shall be final and conclusive upon the parties hereto.

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

105.13 ASSIGNMENT OF CONTRACT

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

construction industry. This Contract may be assigned by the Owner to any corporation, agency, or instrumentality authorized to accept such assignment.

105.14 OWNERSHIP OF SPECIFICATIONS

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

105.15 SHOP DRAWINGS

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

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

c. All shop drawings submitted must bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for proper resubmission. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in his letter or transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though such shop drawings have been approved.

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

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

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

105.16 REQUESTS FOR SUPPLEMENTARY INFORMATION

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

others arising from his failure to comply fully with the provisions of this Section.

105.17 MATERIALS AND WORKMANSHIP

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

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

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

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

e. Specific reference in the Technical Specifications to any article, device, product, material, fixture, form, or type of construction, etc., by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor in such cases, may at his option use any article, device, product, or material, fixture, form or type if construction which, in the judgment of the Engineer expressed in writing, is equal to that named.

105.18 SAMPLES, CERTIFICATES AND TESTS

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

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

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

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

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

1. Name and brand of the product, name of manufacturer, location of plant.

2. Name and location of at least two projects on which substantial quantities of the Material represented by the samples were

used, and the approximate dates of use or installation.

3. An outline showing chemical and physical properties of the material represented by the sample submitted and giving the name of the laboratory or testing authority which obtained the data, and the dates of the tests.

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

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

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

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

1. The manufacturer cannot make satisfactory delivery; or

2. The material delivered fails to comply with the Contract requirements.

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

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

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

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

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

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

4. The Owner will pay all other expenses.

105.19 PERMITS AND CODES

The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. The contractor shall obtain a City of Gadsden business license and all applicable building permits required prior to commencing work. The intent of this Contract is that the Contractor shall base his bid upon the Specifications, but that all work installed shall comply with all applicable codes and regulations as amended by any waivers. Before installing the work, the Contractor shall examine the Specifications for compliance with applicable codes and regulations bearing on the work, and shall immediately report any discrepancy to the Engineer. Where the requirements of the Specification fail to comply with the applicable code and regulation, the Owner shall adjust by change order the Contract to conform to the code or

regulation (unless waivers in writing covering the differences have been granted by the governing authority) and shall make appropriate adjustment in the Contract price. Should the Contractor fail to observe the foregoing provisions and install work at variance with any applicable code or regulation as may be amended by waivers (notwithstanding the fact that such installation is in compliance with the Technical Specifications), the Contractor shall remove such work without cost to Owner, but a change order shall be issued to cover only the excess cost the Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the item involved.

105.20 CARE OF THE WORK

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

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

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

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

e. The Contractor shall shore up, brace, underpin, secure, and protect as may be necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the Project. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages from which the Owner may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

105.21 ACCIDENT PREVENTION

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

105.22 SANITARY FACILITIES

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

105.23 USE OF PREMISES

a. The Contractor shall confine his apparatus, storage of materials, and construction operation to the limits prescribed by ordinances or permits or as may be directed by the Engineer, and shall not unreasonably encumber the premises with his materials.

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

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

105.24 REMOVAL OF DEBRIS, CLEANING, ETC.

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

105.25 INSPECTION

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

b. The Contractor shall furnish promptly all materials reasonably necessary for any tests that may be required. (See Samples, Certificates and Tests, Section 105.20 of the General Conditions). All tests by the Engineer shall be performed in such manner as not to unnecessarily delay the work. Special, full size, and performance tests shall be as described in the Technical Specifications.

c. If any work be covered up without approval or consent of the Engineer, it must, if requested by the Engineer, be uncovered at the expense of the Contractor. Should it be considered necessary or advisable by the Engineer at any time before final acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any material respect, due to fault of the Contractor or his Sub-Contractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the examination, replacement cost plus

fifteen per cent (15%), shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

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

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

105.26 REVIEW BY OWNER

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

105.27 FINAL INSPECTION

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

105.28 DEDUCTION FOR UNCORRECTED WORK

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

105.29 INSURANCE

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

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

b. Commercial General Liability Insurance and Auto Insurance: The Contractor shall procure and shall

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

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

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

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

e. Builder's Risk Insurance (Fire Extended Coverage): Until the project is completed and accepted by the Owner, the Contractor is required to maintain Builders risk Insurance (fire and extended coverage) on a 100 percent (100%) completed value basis on the insurable portion of the project (All Structures and Buildings above grade) for the benefit of the Owner, the Contractor, and the Subcontractors as their interests may appear. The project covered by the Contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.

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

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

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

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

Sample Certificates of Liability In insurance section of attachments.

105.30 QUALIFICATIONS FOR EMPLOYMENT

No persons under the age of sixteen (16) years and no person undergoing sentence of imprisonment shall be employed in the development of the Project. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health and safety of others shall be employed in the development of the Project, provided, that this shall not operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform.

105.31 NON-REBATE OF WAGES

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

105.32 WAGE CLAIMS AND ADJUSTMENTS

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

105.33 PATENTS

The Contractor shall hold and save the Owner, its officers, and employees, harmless from liability of any nature of kind, including costs and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract.

105.34 WARRANTY OF TITLE

No material, supplies or equipment for the work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor warrants good title to all materials, supplies,

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

105.35 GENERAL GUARANTY

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

105.36 LIVE UTILITIES AND OTHER PROPERTY

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

105.37 TRUCK WEIGHTS

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

105.38 INDEMNIFICATION

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

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

105.39 LIMITATIONS ON RESPONSIBILITIES

a. Neither the authority of the Owner or Engineer to act under this Section 105, nor any decision made by either of them in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility to the Contractor, Sub-

Contractor, any of their agents or employees or any other person performing any of the Work.

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

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

d. Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of the Owner or Engineer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to the Owner or Engineer any duty or performance of the Work or any duty or authority to undertake responsibilities contrary to the provisions of paragraph 105.42 b. or 105.42 c.

105.40 SAFETY AND PROTECTION

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

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

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

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

b. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to their protection from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 105.42 b. or 105.42 c. caused, directly or indirectly in whole or in part, by Contractor, any Sub-Contractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be responsible, shall be remedied by Contractor (except damage or loss attributable to the fault of the Specifications or to the acts or omissions of the Owner or Engineer or anyone employed by either of them or anyone for whose acts either of them may be responsible, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor). Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and accepted by the Owner and Engineer.

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

d. EMERGENCIES: In emergencies affecting the safety or protection of persons or the Work or property at the site or

adjacent thereto, Contractor, without special instruction or authorization from the Engineer or Owner, shall act immediately to prevent threatened damage, injury or loss. Contractor shall give the Engineer and Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the Engineer determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variations.

DIVISION 106

SCOPE OF WORK

106.1 APPLICATION

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

106.1A TIME FOR COMPLETION AND LIQUIDATED DAMAGES

1) The work shall commence on the starting time stipulated in the Notice to Proceed and shall be fully completed within **180 consecutive calendar days**.

2) The liquidated damages for this project shall be **$1,000 dollars per day** chargeable to the contractor each day the project continues in excess of the allotted time for completion until such time that the project is accepted by the Owner.

106.2 PROJECT SITE

The project site is located at the Gadsden State Community College Sports Complex. The main campus address is 1001 George Wallace Drive, Gadsden, AL 35903

106.3 RESPONSIBILITIES OF THE CONTRACTOR

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

106.4. WORK NOT INCLUDED IN THE CONTRACT

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

106.5 PROJECT NOTES

General:

1) The Contractor shall provide the City of Gadsden Engineering Department a minimum 48-hour notice prior to performing any contract work.

2) The City will provide the CAD file to the awarded contractor for construction stakeout purposes upon request. The City will not provide the construction stakeout services for this project.

3) The Contractor shall supervise and direct all work. The contractor is responsible for the means, methods, techniques, sequences and procedures of construction.

4) Job safety is the sole responsibility of the Contractor. Any inspections performed to check the work performed by the Engineer or the designated engineering representative will not include safety inspections.

5) The Contractor shall at all times have a designated representative on the project who has the authority to make changes as directed by the Engineer, or his representative.

6) The City reserves the right to increase or decrease any of the plan quantities at the unit price bid with no additional markup allowed. If the contractor believes that added quantities warrant a change in the contract time, it shall be the Contractor's responsibility to contact the Engineer to negotiate a change within 10 days of the order. Failure of the contactor to do this in a timely manner shall result in no change in the contract time.

7) The quantity totals shown for each pay item on the bid sheet are estimated quantities only. It shall be the contractor's responsibility to verify all quantities and confirm material submittal approval before ordering any material. The Contractor will not be paid for unused or uninstalled materials.

8) The contractor is responsible for field locating all utilities prior to commencement of all construction activities. Any existing utility line

damaged during construction shall be replaced at the expense of the Contractor

9) The contractor shall perform video or photographic preconstruction documentation for the surrounding area and property to establish the existing conditions.

10) Contractor shall be responsible to protect all materials and work thru project acceptance.

11) Any reference in the plans or specifications to a specific article, device, product, material, equipment, etc., by name, make, or model shall be interpreted as establishing a baseline standard of quality only and shall not be construed as limiting competition. The contractor shall have the option of submitting any substitution to the Engineer for any specific article, device, product, material, equipment, etc., and request a review for "approved equal" status. The Engineer shall have the sole authority to accept or reject each substitution request received.

12) Contractor shall complete all work shown (or reasonably implied) on the drawings and specified in the contract documents for a complete project with no additional payment being made outside of the payment methods and unit prices set up in the original bid form.

Construction Notes:

1) All material and workmanship shall be in accordance with the ALDOT Standard Specifications for Highway Construction, Latest Edition.

2) Contractor shall provide all temporary drainage required including surface or subgrade dewatering/wellpoint installation required to construct the project at no additional cost to the Owner.

3) Contractor shall be responsible for protecting exposed soils and disturbed areas thru completion of project. Should it become necessary for any soils to be reconditioned, the contractor shall do so at no additional cost to the owner

4) Contractor shall receive approval of the topsoil prior to installation. Topsoil shall be fertile and friable with the ability to produce heavy growth and vegetation. Topsoil shall be free of brush, organic litter, or objectionable weeds, clay, stumps, stones, roots or other material that creates an unnecessary hindrance to planting or maintenance operations.

5) Upon completion, immediately backfill, grade, and completely restore all areas disturbed during the course of construction.

6) At locations to receive new sidewalk, asphalt, or curb & gutter, contractor shall saw-cut and remove existing material from the site (when applicable). Contractor shall prepare and compact sub-grade for installation of new material.

7) The contractor shall provide borrow excavation material that meets the requirements stated in specification section 02300-Earthwork. The contractor shall receive approval of the borrow material prior to placement.

8) Prior to placement of the crushed aggregate base course, the contractor will be required to restore the subgrade to optimum moisture content and compaction, as necessary, to ensure long term pavement performance is preserved. The contractor will not receive additional compensation for this work.

Asphalt Paving, Widening, and Patching:

1) The Engineer reserves the right to alter layer thickness, within reasonable limits, to stay within plan quantities.

2) The unit prices bid shall be payment in full for the complete installation of all hot mix asphalt installed. There shall be no pay factor adjustments for the changes to the asphalt index or construction fuel during the construction of this project.

3) If any segregation, cracks, or raveling occur in the asphalt mix laid as a part of this Contract during construction or the warranty period, the Owner will notify the Contractor about the locations of concern. Thereafter, the Contractor

shall be required to mill the section and repave it at no additional cost to the Owner. Limits of repair section shall be determined by the Engineer, taking aesthetics of the finished product into account.

4) The Contractor and Owner shall check and record the temperature of the mix upon arrival to the project site and upon application. The City of Gadsden reserves the right to refuse any mix not meeting temperature standards as stated in the Alabama Department of Transportation Standard Specifications for Highway Construction, latest Edition. The Contractor will not be compensated for any asphalt rejected by the Owner.

Bid Item Clarification Notes:

BASE BID

Item No. 1 - Mobilization (Maximum 5% of Base Bid):
Unit cost includes all labor, materials, and equipment required for preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of all offices, buildings, and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site. Price shall not exceed 5% of total contract amount. Payment shall be made on a lump sum basis per the following schedule: 1) 70% upon mobilization; 2) remaining 30% upon de-mobilization (end of project). Payment shall be lump sum.

Item No. 2 – Geometric Controls:
Unit price includes all labor, materials, and equipment required to provide all geometric controls necessary to construct the project to the elevations, grades, and locations shown on the plans, called for in the specifications, or as modified by the Engineer during construction. Payment will be lump sum.

Item No. 3 – Demolition:
Unit price includes all labor, materials, and equipment as required to demolish and remove existing items as required by plan detail(s) and applicable section(s). Contractor shall completely remove all items in conflict with the proposed improvements whether shown on the plans or not. Payment will be lump sum.

Item No. 4 – Clearing and Grubbing:
Unit price includes all labor, material, and equipment associated with the removal and proper disposal of underbrush, trees, and roots of the minimum area needed to construct as defined by plan detail(s) and applicable section(s). Contractor shall completely remove all items in conflict with the proposed improvements whether shown on the plans or not. Payment will be lump sum.

Item No. 5 – Site Grading:
Unit price includes all costs for labor, materials, equipment, excavation, transportation, loading/unloading, approved placement, screening, conditioning, compaction, and bringing all finished and/or subgrade elevation to correct grade as required by plan detail(s), applicable section(s), and geotechnical report(s). Includes stripping back the onsite topsoil, stockpiling onsite, and re-installing a 4” thick layer across the non-athletic field areas of the site to the finished grades shown on the plans. Owner shall retain ownership of excess topsoil. Pay Item includes all earthwork not classified by Engineer as Muck or Borrow Excavation. Payment will be lump sum.

Item No. 6 – Muck Excavation (Loose Truck Bed Measurement):
In accordance with applicable plan detail(s), and specification section(s). Unit Price includes all costs for labor, materials, equipment, excavation, transportation, and loading/unloading of unsuitable material to an offsite location. Shall include material classified by Engineer as Muck Excavation. Topsoil shall not be included in this pay item. Payment will be by cubic yard.

Item No. 7 – Borrow Excavation (Loose Truck Bed Measurement):
In accordance with applicable plan detail(s), and specification section(s) Unit Price includes all costs for labor, materials, equipment, excavation, transportation, loading/unloading, fill placement, grading per plans, and compaction of Engineer approved material hauled in from an offsite location. Shall include material classified by Engineer as Borrow Excavation. Payment will be by cubic yard.

Item No. 8 – Bituminous Paving Wearing Layer 165 LB/SY (1.5”):
In accordance with Section 02740. Unit Price includes all labor, materials, and equipment associated with placing, spreading, and compaction of asphalt pavement as detailed in the drawings and

all related items for a complete job. Payment will be per Ton of asphalt measured by batch tickets.

Item No. 9 – Bituminous Paving Binder Layer 275 LB/SY (2.5"):
In accordance with Section 02740. Includes all labor, materials, and equipment associated with placing, spreading, and compaction of asphalt pavement as detailed in the drawings and all related items for a complete job. Payment will be per Ton of asphalt measured by batch tickets.

Item No. 10 – Bituminous Paving Patching Layer 450 LB/SY (4.0"):
In accordance with Section 02740. Includes all labor, materials, and equipment associated with placing, spreading, and compaction of asphalt pavement as detailed in the drawings and all related items for a complete job. Payment will be per Ton of asphalt measured by batch tickets.

Item No. 11 – ALDOT 825, Type B (Misc Use)
Unit price shall include all costs for labor, materials, and equipment for installation of all ALDOT 825, Type B, placed and compacted in accordance with plan detail(s) and applicable section(s). Material and placement shall conform to ALDOT standard specifications for Highway Construction, latest edition.

Item No. 12 – ALDOT No. 57 or 78 Crushed Stone (Misc Use):
Unit price shall include all costs for labor, materials, and equipment for installation of all ALDOT No. 57 or 78 crushed stone, placed and compacted in accordance with plan detail(s) and applicable section(s). Crushed Stone incidental to all utility and storm piping installation shall be included in this pay item. Material and placement shall conform to ALDOT standard specifications for Highway Construction, latest edition.

Item No. 13 – Pavement Striping and Markings:
Unit price includes all costs for labor, materials, and equipment for markings as required by plan detail(s) and applicable section(s). Payment will be lump sum.

Item No. 14 – Parking & Crosswalk Signage:
Unit Price includes all cost of labor, materials and equipment as required by plan detail(s). Payment will be lump sum.

Item No. 15 – 18" Combination Curb and Gutter:
Unit price includes all costs for labor, materials, equipment, layout, forms, concrete, and finish for 18" wide curb and gutter. ALDOT 825, Type B base material is not included in this pay item. Payment will be made per linear foot installed.

Item No. 16 - Concrete Parking Bumper:
Unit price includes all costs for labor, materials, equipment, and layout required by plan detail(s) and applicable section(s). Payment will be made per unit installed.

Item No. 17 – Concrete Flume:
Unit price includes all costs for labor, materials, equipment, layout, forms, concrete, and finish as required by plan detail(s) and applicable sections(s). ALDOT 825, Type B base material is not included in this pay item. Payment will be made per linear foot installed.

Item No. 18 – 4" Concrete Sidewalk:
Unit price includes all costs for labor, materials, equipment, layout, forms, concrete, and finish for sidewalk and ADA ramps required by plan detail(s) and applicable section(s). Contractor shall use the scoring pattern shown on sheet A11. ALDOT 825, Type B base material is not included in this pay item. Payment will be made per square yard installed.

Item No. 19 – Truncated Domes for ADA Ramps:
Unit price includes all cost of labor, materials, and equipment to install truncated dome pavers at the required locations as by plan detail(s) or as directed by the Engineer to comply with ADA standards. The pavers must be cast in place, mats are not acceptable.

Item No. 20 – 6" Concrete Pavement:
Unit price includes all costs for labor, materials, equipment, layout, forms, concrete, and finish required by plan detail(s) and applicable section(s). Concrete associated with dugouts, bullpens, and batting cages shall not be included in this pay item. ALDOT 825, Type B base material is not included in this pay item. Payment will be made per square yard installed.

Item No. 21 – 8" HDPE Storm Pipe:
Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading,

excavation, and backfill for a complete piping installation as required by plan detail(s) and applicable section(s). Payment will be made per linear foot installed.

Item No. 22 – 12" HDPE Storm Pipe:
Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading, excavation, and backfill for a complete piping installation as required by plan detail(s) and applicable section(s). Payment will be made per linear foot installed.

Item No. 23 – 15" HDPE Storm Pipe:
Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading, excavation, and backfill for a complete piping installation as required by plan detail(s) and applicable section(s). Payment will be made per linear foot installed.

Item No. 24 – 18" HDPE Storm Pipe:
Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading, excavation, and backfill for a complete piping installation as required by plan detail(s) and applicable section(s). Payment will be made per linear foot installed.

Item No. 25 – 24" HDPE Storm Pipe:
Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading, excavation, and backfill for a complete piping installation as required by plan detail(s) and applicable section(s). Payment will be made per linear foot installed.

Item No. 26 – HDPE Drain Basin with Grate Inlet or Solid Lid:
In accordance with Section 02630. Unit price includes all costs for labor, materials, equipment, transportation, loading/unloading, excavation, backfill, unit installation, and connection to piping etc. for a complete job. Payment will be made per unit installed.

Item No. 27 - Concrete Junction Box with Grate Inlet or Solid Lid:
In accordance with Section 02630. Unit price includes all costs for labor, materials, equipment, excavation, layout, forms, concrete, unit installation with accessories, and connection to piping. Payment will be made per unit installed.

Item No. 28 – Open Throat Inlet:
In accordance with Section 02630. Unit price includes all costs for labor, materials, equipment, excavation, layout, forms, concrete, unit installation with accessories, and connection to piping. Payment will be made per unit installed.

Item No. 29 – Concrete Sloped Paved Headwalls:
Unit price includes all costs for labor, materials, equipment, layout, forms, concrete, and finish as required by plan detail(s) and applicable sections(s). Payment will be made per unit installed.

Item No. 30 – Domestic Water Connection (6" Tapping Sleeve and Valve):
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with connections of new water mains to existing water mains utilizing tapping sleeve and valve including excavation, removal of coupon, thrust block, testing, cleanup, and all related items. Payment will be per each connection made.

Items No. 31 – 6" CL 350 DI Water Main (Including Fittings):
In accordance with Section 02512. Unit price includes all labor, materials, Fittings, and equipment, associated with excavation (Including rock excavation), installation of pipe at locations shown on plans, installation of detector wire and tape, backfill compaction, disinfection, testing, cleanup, and all related items. Payment will be per linear foot of water main installed.

Items No. 32 – 6" Gate Valve and Box:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation), connection and placement of gate valve, installation of box to correct elevation, concrete ring around top of valve box, valve marker, backfill, testing, cleanup, and all related items. Payment will be per each valve/box installed.

Item No. 33 – 4" Service Connection with 4" Irrigation Meter Vault:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation), tie-in connections, installation of vaults, piping, valves, fittings, equipment, and accessories internal and external to the vaults, backfill, testing clean-up and all related items. Payment will be by lump sum.

Item No. 34 –4" Double Check Backflow Assembly Vault:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation), tie-in connections, installation of vaults, piping, valves, fittings, equipment, and accessories internal and external to the vaults, backfill, testing clean-up and all related items. Payment will be by lump sum.

Items No. 35 – 2" Service Connection and 2" Meter Vault:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation) and installation of tap at main, copper tubing through backflow preventer, corp and curb stops, valves, fittings, meter vaults and boxes, meter and backflow preventer, backfill, testing, clean-up and all related items. Payment will be per each unit installed.

Item No. 36 – 2" Municipex Service Tubing:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation) and installation of cross-linked polyethylene (Municipex) service tubing, connections to building and meter plumbing, backfill, testing, clean-up and all related items. Payment will be per linear foot installed.

Item No. 37 – 3/4" Municipex Service Tubing:
In accordance with Section 02512. Unit price includes all labor, materials, and equipment associated with excavation (including rock excavation) and installation of cross-linked polyethylene (Municipex) service tubing, connections to plumbing and hose bib in backstop wall, backfill, testing, clean-up, coordination with other work and all related items. Payment will be per linear foot installed.

Items No 38 – 6" SDR-26 PVC Gravity Sewer Lateral:
In accordance with Section 02535. Includes all labor, materials, and equipment associated with excavation (including rock excavation), backfill as specified, pipe of the specified material, compaction, testing, clean-up, and all related items. Payment will be per linear foot installed.

Item No. 39 – 6"x4" Clean-out:
In accordance with Section 02535. Includes all labor, materials, and equipment associated with excavation (including rock excavation) piping, fittings, caps, and surface treatments, backfill, compaction, testing, clean-up, and all related items. Payment will be per each clean-out installed.

Item No. 40 – Connection to Existing Sanitary Sewer:
In accordance with Section 02535. Includes all labor, materials and equipment associated with coring hole in existing manhole, sealing devices, installing pipe, grout sealing, testing, clean-up and all related items. Payment will be per each connection made.

Item No. 41 - Erosion Control:
In accordance with Section 02374. The lump sum price will be compensation in full for labor, materials, aggregate, equipment, purchase, transport, loading/unloading, installation, maintenance and removal of the erosion and sediment control plan/devices. The owner has implemented the NPDES permit application in the Owner's Name and will provide inspections and the Contractor shall be responsible for implementation and continuation of Best Management Practices Plan (BMPP) until contract is deemed substantially complete.

Item No. 42 – Infield and Outfield Playing Surface and Drainage:
Unit price includes all labor, materials, equipment, and other incidentals required for the complete installation of the infield and outfield playing surfaces as defined by plan detail(s) and applicable section(s). Pay item shall include preparation of subgrade, subsurface drainage (include tie to site drainage network), drainage layer media, proper root zone media placement, irrigation, sodding, infield mix placement, and any other additional items required for a complete job. Payment will be lump sum.

Item No. 43 – Bermuda Sod (Outside of Athletic Fields):
Unit price includes all cost for labor, materials, and equipment required to install Bermuda sod at all locations outside of the athletic fields as shown on the plan(s). The base bid shall include the installation of only sod within all corridors in lieu of the landscaping plan. The landscaping plan, complete with plant schedule is an additive alternate bid item (A2).

Item No. 44 –Permanent Seeding:

Unit price includes all cost for labor, materials, and equipment required to install seed, fertilizer, and mulch for the permanent establishment of grass at all locations disturbed during construction of the project located outside of the fenced area. Materials, installation, and establishment shall meet ALDOT specifications unless approved otherwise.

Item No. 45 – Irrigation (Outside of Athletic Fields)
In accordance with Section 3284. Unit price includes all cost for labor, materials, and equipment required to install the irrigation system outside of the athletic fields at the locations shown on the plans, including all items of work required for a complete job. Contractor shall submit any deviation for approval prior to construction. Contractor shall submit an as-built drawing upon completion.

Item No. 46 – Press Box Renovations:
Unit price includes all cost of labor, materials, and equipment required to renovate the Press Box as shown on the plans and called for in the specifications. Payment will be lump sum.

Item No. 47 – Chain Link Fencing – 4' Height:
Unit price includes all cost of labor, materials, and equipment to install all 4' high black vinyl coated chain link fencing at the locations shown on the plans, required by plan detail(s), and applicable specification(s). This item shall also include the furnishing and installation of a yellow poly fence guard along all outfield fencing. Payment will be made per linear foot installed.

Item No. 48 – Chain Link Fencing – 8' Height:
Unit price includes all cost of labor, materials, and equipment to install all 8' high black vinyl coated chain link fencing and gates at the locations shown on the plans, required by plan detail(s) and applicable specification(s). This item shall include the single and double gates shown on the plans. Payment will be made per linear foot installed.

Item No. 49 – Backstop Wall:
Unit price includes all cost of labor, materials, and equipment to install the backstop wall at the locations shown on the plans, required by plan detail(s), and applicable specification(s). This item shall also include furnishing and installing one recessed hose bib at each field, for a total of 4 (3/4" Municipex tubing will be paid for separately) and one 4" PVC pipe thru the wall at each field, (for a total of 4), for a ball return. Contractor shall coordinate the installation with the backstop netting system to insure successful installation and function as intended. Payment will be made per linear foot installed.

Item No. 50 – Backstop Netting System:
Unit Price includes all cost of labor, materials, equipment, testing, and engineer inspection to successfully install the backstop netting and poles at the locations shown on the plans, required by plan detail(s), and applicable specification(s). Contractor shall submit the netting system for approval that meets the project requirements. The netting system submitted, including the pole foundation design, shall be stamped by a registered professional engineer in the State of Alabama. Contractor shall coordinate the installation with the backstop wall to insure successful installation and function as intended. Payment will be made per linear foot installed.

Item No. 51 –Bullpen:
Unit Price includes all cost of labor, materials, and equipment to install a bullpen at the locations shown on the plans and in accordance with the plan detail(s) and specification(s) including 6" concrete pavement, outdoor turf, and all misc. accessories for a complete job. ALDOT 825, Type B base material is not included in this pay item. Associated chain link fencing and gates is not included in this item. Payment will be per each bullpen installed.

Item No. 52 – Batting Cage System:
Unit Price includes all cost of labor, materials, and equipment to install the batting cage at the location shown on the plans, required by plan detail(s), and applicable specification(s), including 6" concrete pavement, poles, netting, outdoor turf, and all misc. accessories for a complete job. ALDOT 825, Type B base material is not included in this pay item. Contractor shall submit the batting cage system for approval that meets the project requirements. The batting cage system design submitted shall be stamped by a registered professional engineer in the State of Alabama. Payment will be lump sum.

Item No. 53 – New Dugout
Unit Price includes all cost of labor, materials, and equipment to install a new dugout at the location shown on the plans (fields 1, 2, and 4 only), required by plan detail(s), and applicable specification(s), including concrete foundation, structure, roof, associated chain link fencing, electrical, and (3) gates per dugout. The new dugout baseline design is Dugouts USA Model: ST830 or approved equal. Contractor shall submit the new dugout design for

approval that meets the project requirements. The new dugout, including the concrete pad/foundation design submitted, shall be stamped by a registered professional engineer or architect in the State of Alabama.

Item No. 54 – Repair Existing CMU Dugout:
Unit Price includes all cost of labor, materials, and equipment as required by plan detail(s) and specification(s) to repair and retain the two existing cmu dugouts (including the storage area of the visitors' dugout) located on field 3. Repair shall include, pressure wash cleaning all faces, replace existing membrane roof with a new TPO roof membrane, electrical upgrades, existing ceiling shall be removed and replaced with new painted pressure treated water resistant plywood and battens, and repainting all paintable surfaces.

Item No. 55 – Bleachers
Unit Price includes all cost of labor, materials, and equipment to install the bleachers specified (or approved equal) at the locations shown on the plans.

Item No. 56 – Athletic Field Accessories
Unit Price includes all cost of labor, materials, and equipment to install the foul poles, home plate, bases, and pitching rubber specified (or approved equal) at the locations shown on the plans.

Item No. 57 – Electrical & Lighting:
Unit Price includes all cost of labor, materials, and equipment as required by plan detail(s) to install the complete electrical and lighting system in accordance with the plans and specifications. Payment will be lump sum.

Item No. 58 – Contingency:
The contingency item shall only be used as approved and directed by the Engineer.

ADDITIVE ALTERNATES

Item No. A1 –Shade Sails:
Unit Price includes all cost of labor, materials, and equipment as required by plan detail(s) and specification(s) to install the shade sail system in conjunction with each set of bleachers. Contractor shall submit the shade sail system for approval that meets the project requirements and be responsible for coordinating the correct dimensions needed around the specified bleachers. The shade sail system, including the foundation design submitted shall be stamped by a registered professional engineer in the State of Alabama

Item No. A2 - Landscaping:
Unit Price includes all cost of labor, materials, and equipment to install the landscaping plan as required by plan detail(s), shown on the plant schedule, and specified in the specification(s). The Bermuda sod shown in the landscaping plan shall remain to be paid under base bid pay item No. 42.

Item No. A3 –Alternate Dugout
Unit Price includes all cost of labor, materials, and equipment to demolish the existing CMU dugouts at field 3, and install the alternate dugout design shown in the plan assembly at every field (fields 1, 2, 3, & 4), required by plan detail(s), and applicable specification(s), including concrete pad, foundation, structure, roof, fencing, electrical etc. for a complete job.

TABLE OF CONTENTS

END OF SECTION

SECTION 02060

AGGREGATE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Basis of Measurement: Refer to Division 106 – Scope of Work

1.4 SUBMITTALS

A. Division 105 – General Conditions

B. Samples: Submit 10-gallon sample of each type of aggregate to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse aggregate shall consist of crushed gravel or stone having hard, strong, durable pieces, free from adherent coatings.

B. Coarse Aggregate Type A1 (ALDOT Aggregate size No. 4) shall be graded in accordance with the following limits:

Sieve Size	Percent Passing
2 inches	100
1-1/2 inch	90 to 100
1 inch	20 to 55
3/4 inch	0 to 15
1/2 inch	-----
3/8 inch	0 to 5
No. 4	-----
No. 8	-----
No. 16	-----
No. 50	-----
No. 200	-----

C. Coarse Aggregate Type A2 (ALDOT Aggregate size No. 57) shall be graded in accordance with the following limits:

Sieve Size	Percent Passing
2 inches	-----
1-1/2 inch	100
1 inch	95 to 100
3/4 inch	-----
1/2 inch	25 to 60
3/8 inch	-----
No. 4	0 to 10
No. 8	0 to 5
No. 16	-----
No. 50	-----
No. 200	-----

D. Coarse Aggregate Type A3 (ALDOT Aggregate size No. 78) shall be graded in accordance with the following limits:

Sieve Size	Percent Passing
2 inches	-----
1-1/2 inch	-----
1 inch	-----
3/4 inch	100
1/2 inch	90 to 100
3/8 inch	40 to 75
No. 4	5 to 25
No. 8	0 to 10
No. 16	0 to 5

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type A4 (Concrete Sand): Washed sand; free of loam, friable or soluble materials, and organic matter; non-plastic; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 90
No. 50	5 to 30
No. 100	0 to 10

B. Fine Aggregate Type A5 (Natural Sand): Natural sand; free of loam, friable or soluble materials, and organic matter; non-plastic; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95 to 100
No. 8	----
No. 16	50 to 80
No. 50	20 to 50
No. 100	10 to 25
No. 200	5 to 12

2.3 SOURCE QUALITY CONTROL

A. Division 105 – General Conditions

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, ASTM D4318, or ASTM C136.

A. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, ASTM D4318, or ASTM C136.

B. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate aggregate materials from on-site locations as specified in Section 02300.

B. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

A. Stockpile materials on site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02084

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes precast concrete utility structures:
   1. Drainage system catch basins.
   2. Drainage system inlets.
   3. Drainage system junction boxes.
   4. Drainage system sedimentation chambers.
   5. Drainage system retention/diversion structures.
   6. Sanitary sewer lift station pits.
   7. Sanitary sewer lift station valve chambers.
   8. Sanitary drain field dosing chambers.
   9. Single cell box culverts.
   10. Oil water separators.
   11. Grease interceptors.
   12. Valve pits.
   13. End walls.
   14. Pipe ends.
   15. Frames and covers.
   16. Access hatches.

B. Related Sections:
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Precast Concrete Utility Structures:
   1. Basis of Measurement: Refer to Division 106 – Scope of Work

1.3 REFERENCES

A. American Association of State Highway Transportation Officials:
   1. AASHTO M306 - Drainage Structure Castings.
   2. AASHTO S99-HB - Standard Specifications for Highway Bridges.

B. American Concrete Institute:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
   3. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

C. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
3. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
6. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
7. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
8. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
9. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
10. ASTM C33 - Standard Specification for Concrete Aggregates.
11. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
12. ASTM C150 - Standard Specification for Portland Cement.
13. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
14. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
17. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
18. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
19. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
20. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
21. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
22. ASTM C1433 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.

D. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.
2. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

E. National Precast Concrete Association:
1. NPCA Quality Control Manual for Precast Plants.
2. NPCA Plant Certification Program.

DESIGN REQUIREMENTS

F. Design structures for minimum loads in accordance with ASTM C857.
   1. Roof Live Load: ASTM C857, HS20-44 including impact load.
   2. Dead Loads: Actual weight of materials producing static load.

1.4 SUBMITTALS

A. Division 105 – General Conditions

B. Shop Drawings:
   1. Indicate structure locations, elevations, sections, equipment supports, piping, and conduit sizes and elevations of penetrations.
   2. Indicate design, construction and installation details, typical reinforcement and additional reinforcement at openings and concrete strength for each type, size and configuration.

C. Product Data:
   1. Submit data for frames and covers, steps, component construction, features, configuration and dimensions.

D. Design Data:
   1. Submit concrete mix design for each different mix.
   2. Submit design calculations for custom fabrications signed and sealed by professional engineer registered in the State of Alabama.

1.5 QUALITY ASSURANCE

A. Obtain precast concrete utility structures from single source.

B. Perform structural design in accordance with ACI 318.

C. Perform Work in accordance with NPCA Quality Control Manual for Precast Plants.

D. Conform to the following for material and fabrication requirements:
   1. Single Cell Box Culverts: ASTM C1433.
   2. Three Sided Structures: ASTM C1504.
   3. Other Structures: ASTM C913.

E. Perform welding in accordance with the following:
   1. Structural Steel: AWS D1.1.
   2. Reinforcing Steel: AWS D1.4.

1.6 QUALIFICATIONS

A. Manufacturer: Certified by NPCA Plant Certification Program prior to and during Work of this section.

B. Installer: Company specializing in performing work of this section with minimum 5 years experience.

C. Design custom utility structures under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Alabama.

D. Welders: AWS qualified within previous 12 months.

1.7 DELIVERY, STORAGE AND HANDLING

A. Division 105 – General Conditions

B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast structures. Lift structures from designated lifting points.

C. Do not deliver products until concrete has cured 14 days or attained minimum 80 percent of specified 28-day compressive strength.

D. Store precast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

E. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE UTILITY STRUCTURES

A. Precast Concrete Utility Structures: Reinforced precast concrete.

B. Foundation Slab: Cast-in-place or Precast concrete of type specified in Section 03300, leveled top surface.

2.2 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C33, except gradation requirements do not apply.

C. Water: Clean and not detrimental to concrete.

2.3 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical Admixtures: ASTM C494.
1. Type A - Water Reducing.
2. Type B - Retarding.
3. Type C - Accelerating.
4. Type D - Water Reducing and Retarding.
5. Type E - Water Reducing and Accelerating.

C. Fly Ash: ASTM C618 Class F.

2.4 CONCRETE REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished.

B. Reinforcing Wire:
1. Plain Wire: ASTM A82; unfinished.
2. Deformed Wire: ASTM A496 unfinished.

C. Welded Steel Wire Fabric:
1. Plain Wire: ASTM A185; unfinished.
2. Deformed Wire: ASTM A497; unfinished.

2.5 FRAMES AND COVERS

A. Manufacturers:
1. John Bouchard and Sons, Inc.
2. East Jordan Iron Works.
3. Neenah Foundry Co.
4. Substitutions: Division 105 – General Conditions

B. Product Description: Cast iron construction.
1. Lid: Machined flat bearing surface, removable lid, closed cover design; traffic load rated.
2. Grate: Bicycle Safe grate.
3. Nominal Lid or Grate Size: See Drawings.

2.6 ACCESS HATCHES

A. Manufacturers:
1. Thompson Fabricating Company
2. The Bilco Company.
3. U.S.F. Fabrication Inc.
4. Substitutions: Division 105 – General Conditions

B. Access Hatch: Aluminum welded construction; 6 x 4 feet in size; double door.
1. Cover: Diamond plate reinforced with structural stiffeners to support required loads.
2. Frame: Channel type; with integral seat to support cover stiffeners; anchor flange around frame perimeter.
3. Hinges: Stainless steel.
4. Lift Handle: Flush drop handle, non-removable type mounted in cover.
5. Lifting Mechanism: Stainless steel compression springs with automatic hold open and dead stop to retain cover in open position. Cover springs to prevent contact by personnel entering utility structure.

6. Latch Mechanism: Stainless steel lock with removable external handle and permanent internal release mechanism.
7. Hardware: Stainless steel.
8. Finish: Mill

2.7 ACCESSORIES

A. Steps: Formed steel reinforced polypropylene rungs.
1. Diameter: 3/4 inch.
2. Width: 12 inches.
3. Spacing: 16 inches on center vertically.

B. Inserted and Embedded Items:
1. Structural Steel Sections: ASTM A36/A36M; minimum 1.25 oz/sq ft galvanized coating.

C. Joint Sealants and Joint Gaskets:
1. Gasket Joints for Circular Concrete Pipe: ASTM C443; standard rubber gaskets.
2. External Sealing Bands: ASTM C877; Type I rubber and mastic bands.
3. Preformed Joint Sealants for Concrete Pipe and Box Sections: ASTM C990.

D. Pipe Entry Connectors: Modular, mechanical seal consisting of rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

E. Grout:
1. Cement Grout: Portland cement, sand and water mixture with stiff consistency to suit intended purpose.
2. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

F. Bituminous Coating:
1. Required at all locations where aluminum surfaces are in contact with concrete.

2.8 CONCRETE MIX

A. Concrete mix design for pre-cast concrete structures shall be as recommended by the manufacturer.

2.9 FABRICATION

A. Fabricate precast concrete utility structures in accordance with ACI 318 and NPCA Quality Control Manual for Precast Plants.

B. Fabricate precast concrete utility structures to size, configuration and openings as indicated on Drawings.

C. Construct forms to provide uniform precast concrete units with consistent dimensions.

D. Clean forms after each use.

E. Install reinforcing by tying or welding to form rigid assemblies. Position reinforcing to maintain minimum 1-inch cover. Secure reinforcement to prevent displacement when placing concrete.

F. Position and secure embedded items to prevent displacement when placing concrete.

G. Deposit concrete in forms. Consolidate concrete without segregating aggregate.

H. Provide initial curing by retaining moisture using one of the following methods:
   1. Cover with polyethylene sheets.
   2. Cover with burlap or other absorptive material and keep continually moist.
   3. Apply curing compound in accordance with manufacturer's instructions.

I. Provide final curing in accordance with manufacturer's standard.

J. Remove forms without damaging concrete.

2.10 CONCRETE FINISHES

A. Formed Surfaces Not Exposed to View: As formed.

B. Unformed Surfaces: Finish with vibrating screed or hand float.
   1. Permitted: Color variations, minor indentations, chips, and spalls.
   2. Not Permitted: Major imperfections, honeycomb, or other defects.

C. Exposed to View Finishes: Troweled.

2.11 SOURCE QUALITY CONTROL

A. Division 105 – General Conditions

B. Perform the following tests for each 150 cy of concrete placed, with minimum one set of tests each week.
   1. Slump: ASTM C143/C143M.
   2. Compressive Strength: ASTM C31/C31M, ASTM C192/C192M and ASTM C39/C39M.
   3. Air Content: ASTM C231 or ASTM C173.
   4. Unit Weight: ASTM C138.

C. Visually inspect completed precast structures for defects.
   1. Repair defects affecting exposed to view surfaces to achieve uniform appearance.
   2. Repair honeycomb by removing loose material and applying grout to produce smooth surface flush with adjacent surface.
   3. Repair major defects only when permitted by Engineer.

D. Make test results available to Engineer upon request.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Conditions

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify correct size and elevation of excavation.

D. Verify subgrade and bedding is properly prepared, compacted and ready to receive Work of this section.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Install underground precast utility structures in accordance with ASTM C891.

B. Lift precast concrete structures at lifting points designated by manufacturer.

C. When lowering structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

D. Install precast concrete base to elevation and alignment indicated on Drawings.

E. Install precast concrete utility structures to elevation and alignment indicated on Drawings.

F. Assemble multi-section structures by lowering each section into excavation.
   1. Clean joint surfaces.
   2. Install watertight joint seals in accordance with manufacturer's instructions using external sealing bands.

G. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with grout.

H. Connect pipe to structure and seal watertight. Cut pipe flush with interior of structure.

I. Grout base to achieve slope to exit piping. Trowel smooth. Contour as indicated on Drawings.

J. Paint interior with 2 coats of bituminous interior coating at rate of 120 square feet per gallon for each coat.

K. Set frame and cover or access hatch level without tipping, to elevations indicated on Drawings.
   1. Set cover 2 inches above finished grade for structures located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.
   2. Connect drain from access hatch frame to storm drainage system.

L. Touch up damaged galvanized coatings.

M. Backfill excavations for structures in accordance with Section 02300.

END OF SECTION

SECTION 02225

MINOR DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolishing designated building equipment and fixtures.
2. Demolishing designated construction.
3. Cutting and alterations for completion of the Work.
4. Removing designated items for Owner's retention.
5. Protecting items designated to remain.
6. Removing demolished materials.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplementary Conditions, Special Conditions, Technical Specifications, and General Requirements.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Basis of Measurement: Refer to Division 106 – Scope of Work

1.3 SUBMITTALS

A. Division 105 – General Conditions

B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

C. Shop Drawings:
1. Indicate demolition and removal sequence.
2. Indicate location of items designated for Owner's retention.
3. Indicate location and construction of temporary work.

1.4 CLOSEOUT SUBMITTALS

A. Division 105 – General Conditions

B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

C. Operation and Maintenance Data: Submit description of system, inspection data, and parts lists.

1.5 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

1.6 SCHEDULING

A. Schedule Work to coincide with new construction.

B. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation.

C. Coordinate utility service interruptions with Owner.
   1. Do not disable or disrupt building existing utility systems without two days prior written notice to Owner.
   2. Schedule tie-ins to existing systems to minimize disruption.

1.7 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Cease operations immediately if structure appears to be in danger and notify Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public.

3.2 SALVAGE REQUIREMENTS

A. Coordinate with Owner to identify items and equipment required to be removed and delivered to Owner.

B. Tag components and equipment Owner designates for salvage.

C. Protect designated salvage items from demolition operations until items can be removed.

D. Carefully remove items and equipment indicated to be salvaged.

E. Disassemble as required to permit removal.

F. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.3 DEMOLITION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Do not close or obstruct roadways or walkways without permits.

C. Cease operations immediately when structure appears to be in danger and notify Engineer.

D. Disconnect and remove designated utilities within demolition areas.

E. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

F. Demolish in orderly and careful manner. Protect existing facilities.

G. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

H. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

I. Remove temporary Work.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and culverts.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 SUBMITTALS

A. Division 105 – General Conditions

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 QUALITY ASSURANCE

A. Conform to applicable codes for environmental requirements, disposal of debris, burning debris on site, use of herbicides, and disposal of sludge.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Conditions

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Alabama One Call service at 1-800-292-8525 or 811 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 12 inches.

B. Remove trees and shrubs within indicated areas. Remove stumps, surface rock, and fences.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, and gutters. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

E. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.7 SITE RESTORATION

A. Restore all areas disturbed by the construction activities to pre-construction conditions or better.

B. Restore areas to satisfaction of Owner and Land Owner if work has occurred on private property.

C. If preconstruction documentation of existing conditions has not been performed, restore areas to complete satisfaction of Owner and Land Owner at no additional cost to Owner.

D. Restore paved or unpaved streets, roads, sidewalks, curbs, etc. disturbed by the construction activities to preconstruction conditions or better using materials and workmanship conforming to requirements of Owner, City or Alabama Department of Transportation, whichever applies.

E. Maintain seeded areas and re-seed as needed until a stand of grass satisfactory to the Owner is established.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparing of subgrade and grading for buildings, slabs, walks, embankments, slopes and pavements.
   2. Excavating and backfilling of utility trenches.

B. Related Documents
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Base Material:
   1. Refer to Division 106 – Scope of Work

B. Aggregate:
   1. Refer to Division 106 – Scope of Work

C. Structural Fill:
   1. Refer to Division 106 – Scope of Work

D. General Fill:
   1. Refer to Division 106 – Scope of Work

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO R 18 – Establishing and Implementing a Quality System for Construction Materials Testing Laboratories.

B. ASTM International:
   1. ASTM D 698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D 1556 – Standard Test Method for Density and Unit Weight of Soil in place by the Sand-Cone Method
   3. ASTM D 1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   5. ASTM D 2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depth).
   6. ASTM D 2937 – Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
   7. ASTYM D 3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (shallow depth).
   8. ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
   9. ASTM D 4959 – Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating.
   10. ASTM D 6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
   11. ASTM D 7830 Standard Test Method for In-Place Density and Water Content of Soil Using an Electromagnetic Soil Density Gauge

1.4 DEFINITIONS

A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

B. Unauthorized excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will evaluate conditions. If Engineer determines that bearing materials at required subgrade are unstable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.
   1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed soil or rock, or the compacted fill layer immediately below structures, granular base, drainage fill, or topsoil materials.

E. Structures: Buildings, foundations, slabs, tanks, pavements, gravel drives or road, walks, curbs, cut slopes, fill embankments, utilities, or other man-made stationary features occurring above or below ground surface.

F. Structural Areas: Those plan locations containing a structure plus a minimum of 5 feet beyond the outside edge of the structure including appurtenances or as defined elsewhere in the project documents.

G. Structural Fill: Materials placed as fill in Structural Areas.

1.5 SUBMITTALS

A. Division 105 – General Conditions

B. Materials Source: Submit name of imported materials source.

C. Test Reports: All test reports must be completed under the supervision of a registered engineer, licensed in the state in which the project is located. Contractor will notify testing agency a minimum of 24 hours prior to performing work that requires testing. Submit the following test reports directly to Engineer, with copy to Contractor:

1. Test reports on borrow material. (ASTM D-2487, 4318, 6913)
2. Verification of each foundation bearing surface in accordance with specified requirements.
3. Field reports of in-place density tests.
4. One optimum moisture-maximum density curve for each type of soil encountered. (ASTM D-698 or ASTM D-1557)
5. Subgrade evaluation report for all structural areas prior to fill placement and after establishing final subgrade, but prior to pavement or building slab construction.

1.6 QUALITY ASSURANCE

A. Furnish each soil material from single source throughout the Work.

B. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

C. Testing and Inspection Service: Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory in accordance with Section 01200 to perform soil testing and inspection service during earthwork operations. Laboratory shall be selected by the Engineer.

D. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Engineer's satisfaction, based on evaluation of laboratory submitted criteria conforming to AASHTO R18, that it has the experience and capability to conduct the required field and laboratory geotechnical testing.

1.7 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports (if performed) was used for the basis of the design and are available to the Contractor for information only. Conditions noted in the report(s) are not intended as representations or warranties of accuracy or

continuity between soil borings. The Owner and Engineer will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner at no expense to the Owner.

2. Do not interrupt existing utilities serving facilities occupied by Owner or others during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hour notice to Engineer and receive written notice to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active. Resultant excavations must be backfilled in lifts and tested in accordance with the project requirements.

C. Use of Explosives: Use of explosives is not permitted.

D. Jobsite safety and conformance to applicable codes and guidelines to protect persons and property is solely the responsibility of the contractor.

1. Excavate in accordance with OSHA guidelines. Barricade open excavations.
2. Operate safety barriers, markings and warning lights as required to maintain a safe work environment and as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements, and other facilities to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
4. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 PRODUCTS

A. Base Material: Naturally or artificially graded mixture of crushed gravel or stone, sand or select granular materials conforming to the Department of Transportation requirements for the state in which the project is located.

B. Aggregate: Graded fine or coarse aggregates as specified in Section 02060.

C. Structural Fill: On or off-site soil free of rock or gravel larger than three (3)" in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material shall have a liquid limit of fifty (50) or less, a plasticity index of twenty-five (25) or less, less than 30% rock fragments retained on a 3/4" sieve, and a maximum dry density of at least 100 pcf. May also consist of Crushed Aggregate Base Course.

D. General Fill: On or off-site soil and/or rock which is stable and can be compacted to the specified density. Rock fragments shall be less than four (4)" in largest dimension and blended with sufficient fines to create a dense fill mass free of visible voids.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas as directed by the Engineer.

B. Stockpile excavated material meeting requirements for satisfactory soil materials and topsoil materials.

C. Remove excess excavated material not intended for reuse from site.

D. Excavate to subgrade elevations or cut line as indicated, regardless of character of materials and obstructions encountered, including rock, existing structures, and utilities. Subsurface materials are unclassified.

3.2 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction. Design of retaining structures must be performed, signed and sealed by a registered engineer licensed in the state in which the project is located.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

1. Provide permanent steel sheet piling or reinforced concrete drilled shaft walls wherever subsequent removal of retaining structure might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2’-6” below final grade and leave permanently in place.

3.3 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations or in foundation excavations prior to or following footing construction. Remove water to prevent softening of foundation boring soils, undercutting footings, and soil changes detrimental to stability of the subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
3. Dewater excavations only as necessary for suitable construction. Do not continue dewatering overnight or for an extended period of time except as required.

3.4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Stabilize in accordance with ADEM and NPDES regulations.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess excavated soil material and materials not acceptable for reuse as backfill or fill.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim sides and bottom to required lines and grades. Compact with hand or remote operated equipment to leave solid base to receive other work.
2. For pile foundations, stop excavations from 6 inches to 12 inches above bottom of cap before piles are placed. After piles have been placed, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavations for soil supported foundations must be neat, clean and dry. Remove loose, disturbed and soft soil. Dewater only as necessary for proper construction.

3.6 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 36 inches total width.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on structural fill or undisturbed soil and bedding material. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. No direct payment will be made for rock removal, unless specified in other sections.
2. For pipes or conduit in all other soil conditions, refer to Section 02324 – Utility Trenching.

3.8 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature isless than 35 degrees F.

B. Do not place frozen soil fill.

3.9 BACKFILL AND FILL

A. General: Place soil material in uniform, horizontal lifts as required to final subgrade elevations. Compact individual lifts uniformly to specified density prior to placing the subsequent lift. For each area classification listed below, use materials specified in Part 2 of the Section.

1. In non-structural areas, use general fill. The final lift shall be the required thickness of topsoil.
2. In structural areas, use structural fill or aggregate. The final lift shall be as indicated on the plans.
3. Under utilities, use aggregate as indicated on the plans in areas determined by the Engineer to be unsuitable for pipe bedding. Shape excavation bottom to fit bottom 90 degrees of cylinder.
4. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings or that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
   a. Concrete is specified in Section 03300.
   b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
5. Provide 4-inch-thick concrete base slab support for piping or conduit less than 24” below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway base.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.10 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, topsoil, obstructions, underground structures (foundations, slabs, walls and utilities), and deleterious materials from area prior to placement of fills. Backfill disturbed areas with compacted and tested fill. Contractor shall notify Engineer to evaluate the natural ground prior to fill placement. Where access permits, Contractor shall provide pneumatic-tired equipment capable of producing the pressure equal to that produced by a fully-loaded, tri-axle dump truck for use in evaluation.

1. When existing ground exhibits instability, scarify ground surface, moisture-condition to within 2% of the optimum moisture content, and compact to the project requirements. Alternatively, remove and replace unstable soils with suitable, compacted soils or stabilize at the direction of the Engineer.
2. Bench sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface. Benches shall consist of alternating horizontal and vertical soil surfaces in the original ground with horizontal benches no more than 5 feet apart vertically.
3. Overbuild slopes and cut back to the desired configuration to ensure the soils at the slope face are properly compacted and tested.

B. In structural areas, place structural fill or aggregate in layers not more than 8 inches in loose thickness for material compacted by heavy compaction equipment, and not more than 4 inches in loose thickness for material compacted by hand-operated tampers. In non-structural areas, place general fill in maximum 24" thick lifts.

C. In structural areas, before compaction, moisten or aerate each layer of fill as necessary to provide moisture content within the fill at ±2% of the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place structural fill on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping

or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Standard Proctor Density Requirements:
   a. Structural Areas: Compact each individual lift of structural fill and fine aggregate to not less than 98% of the maximum standard Proctor density in accordance with ASTM D-698. Compact each individual lift of coarse aggregate using multiple passes of a vibratory compactor or as directed by the Engineer.
   b. Non-Structural Areas: Compact each individual lift using multiple passes of a compactor designed for the type of soils used as fill or backfill.
2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
   a. Remove and replace, or scarify and air dry soil material that is too wet to permit compaction to specified density.
   b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.11 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition area. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.

C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch.

D. Athletic Field Grading: In accordance with Section 02910.

E. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.12 PAVEMENT BASE COURSE

A. General: Base course consists of placing base material in layers of specified thickness, over subgrade surface to support a pavement base course.
   1. Refer to other Division 2 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of base course.

C. Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each base course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of base course.

D. Placing: Place base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base material during placement operations.
   1. When a compacted base course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches when compacted.
   2. Compact individual lifts of the base to a minimum of 100% of the ASTM D-1557 maximum dry density at ±2% of the optimum moisture content.

3.13 BUILDING SLAB DRAINAGE COURSE

A. General: Drainage course consists of placing aggregate in layers of indicated thickness over subgrade surface to support concrete building slabs.

B. Placing: Place aggregate on prepared subgrade in layers of uniform thickness, conforming to the indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
   1. When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches when compacted.
   2. Compact the individual lifts of the drainage course with a vibratory compactor as directed by the Engineer.

3.14 FIELD QUALITY CONTROL

A. Quality Assurance consisting of testing and observation of a limited sampling of construction materials will be paid for using the testing allowance for acceptance purposes. Passing test results are not a warranty, guarantee, or certification by the testing agency, Engineer, or Owner that all work was performed in conformance with the plans and specifications. Therefore, the Contractor should not rely solely on test results generated by the quality assurance process as an indication of the suitability of the construction.

B. It is entirely the Contractor’s responsibility to perform quality control as necessary to construct the project in conformance with the plans and specifications. Deviations from

the plans and specifications, whether identified during construction or following the completion of construction, must be corrected by the Contractor at no cost to the Owner.

C. Quality Control Testing During Construction: Allow testing service (to be selected by Engineer) to test each subgrade and fill layer before further backfill or construction work is performed.

1. Perform field density tests on each lift of fill in accordance with ASTM D 2937 (Drive Cylinder Method), ASTM D 2922 (Nuclear Method), ASTM D 7830 (Electromagnetic Method), or ASTM D 1556 (sand cone method).

   a. In conjunction with each density test, the natural moisture content shall be determined in accordance with ASTM D 3017 (nuclear method), ASTM D 4959 (direct heating), ASTM D 7830 (electromagnetic method) or other method approved by the Engineer.
   b. If field tests are performed using nuclear or electromagnetic methods, make calibration checks using alternate methods of both density and moisture results on each different type of material encountered and at intervals as directed by the Engineer.

2. Footing Subgrade: For all soil on which footings will be placed, perform tests to verify required design bearing capacities. Engineer shall be notified to observe and approve each footing subgrade. Engineering evaluation may include the excavation of hand augers or test pits. The contractor shall provide suitable equipment to excavate test pits as directed by the Engineer.
3. Paved Areas and Building Slab Subgrade: Perform at least one field density test per lift for every 2,500 sq. ft. of area, but in no case fewer than three tests.
4. Foundation Wall Backfill: Perform at least two field density tests on each lift of fill placed at locations directed by the Engineer.

D. If in opinion of Engineer, based on testing reports or Engineering judgement, subgrade or fill that have been placed are unsuitable, perform additional compaction and testing until specified density is obtained. Do not place additional fill over materials that have not been approved by the Engineer. Work to recompact and retest unsuitable areas will be at the expense of the contractor.

3.15 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction and/or as described in the Plans.

B. Unless otherwise specified in the Plans, the contractor is responsible to apply for and obtain any required permits in the contractor's name associated with current NPDES guidelines. Requirements for implementing and maintaining an acceptable Best Management Practices Plan shall be the responsibility of the contractor. The contractor is responsible to maintain the NPDES permit in good standing with the regulatory authority and comply with applicable NPDES regulations during construction, and terminate permit upon completion and approval at no additional cost to the owner.

3.16 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.
   1. Secure a disposal site and all necessary approvals for use.
   2. Remove excess excavated material, trash, debris, and waste materials and dispose of it off Owner's property.
   3. Excavated material in area noted on plans shall be screened by geotechnical engineer. If classified "contaminated", it shall be stockpiled and monitored by the contractor at no additional cost.

END OF SECTION

SECTION 02324

UTILITY TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities.
2. Backfilling and compaction.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Refer to Division 106 – Scope of Work

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Structures: Buildings, foundations, slabs, tanks, pavements, walks, curbs, cut slopes, fill embankments, utilities, or other man-made stationary features occurring above or below ground surface.

C. Structural Areas: Those plan locations containing a structure plus a minimum of 5 feet beyond the outside edge of the structure including appurtenances or as defined elsewhere in the project documents.

D. Structural Fill: Materials placed as fill in Structural Areas.

1.5 SUBMITTALS

A. Product Data: Submit data for geotextile fabric indicating fabric and construction.

B. Materials Source: Submit name of imported fill materials suppliers.

1.6 QUALIFICATIONS

A. Prepare erosion control plan and submit to Engineer prior to start of construction.

B. Refer to Section 02374, Erosion Control Devices.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General fill: As specified in Section 02300.

B. Aggregate Fill: As specified in Section 02300, Section 02060, and the Plans.

C. Structural Fill: As specified in Section 02300.

D. Concrete: Structural concrete as specified in Section 03300 with compressive strength of 3,000 psi.

E. Lean Concrete: Non-structural concrete with a compressive strength of 2,000 psi.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

C. Maintain proper horizontal alignment of utilities not laid on grade.

3.2 PREPARATION

A. Call Alabama One Call service at 1-800-292-8525 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Erect erosion control devices prior to excavation.

B. Excavate subsoil required for utilities to the depth indicated on the Drawings.

C. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume. Remove larger material as specified in Section 02316.

D. Perform excavation within 24 inches of existing utility in accordance with utility's requirements.

E. Do not advance open trench more than 400 feet ahead of installed pipe.

F. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 12 inches of clearance on each side of pipe or conduit.

G. Remove water or materials that interfere with Work.

H. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil and bedding material. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

I. Do not interfere with 45 degree bearing splay of building foundations or roadbeds.

J. When subsurface materials at bottom of trench are loose or soft, notify Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A1 and compact to density equal to or greater than requirements for subsequent backfill material.

L. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with concrete as directed by Engineer.

M. Remove excess subsoil not intended for reuse, from site.

N. Maintain trench depth sufficient to provide a minimum cover of 30 inches over utility pipe unless otherwise noted in the Drawings. Maintain a minimum of 36 inches cover under highway ditches.

3.4 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction. Design of retaining structures must be performed, signed and sealed by a registered engineer licensed in the state in which the project is located.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

1. Provide permanent steel sheet piling or reinforced concrete drilled shaft walls wherever subsequent removal of retaining structure might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2’-6” below final grade and leave permanently in place.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches as follows:

1. In non-structural areas, use excavated material to backfill to existing contours and elevations, unless such material does not conform to the requirements of General Fill as outlined in Section 02300. In such instances, borrow material meeting those requirements shall be brought in to backfill the trench. The final lift shall be the required thickness of topsoil.
2. In structural areas, use structural fill as shown on the Plans or as directed by the Engineer. Backfill to elevations reflected on the plans, or to match surrounding grade. The final lift shall be as indicated on the plans. If subgrade is unstable, prepare subgrade beneath pipe in accordance with Section 2300 prior to fill placement.
3. Use aggregate as indicated on the plans in areas determined by the Engineer to be unsuitable for pipe bedding. Shape excavation bottom to fit bottom 90 degrees of cylinder.
4. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings or that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
    a. Concrete is specified in Section 03300.
    b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
5. Provide 4-inch-thick concrete base slab support for piping or conduit less than 24” below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway base.

B. Place, moisture condition, and compact fill material in accordance with Section 02300.

C. Employ placement method that does not disturb or damage utilities in trench, or structures near the trench.

D. Do not leave trench open at end of working day.

3.6 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 02371

RIPRAP AND ROCK LINING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Riprap placed loose.
   2. Riprap placed in bags.

B. Related Sections:
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 SUBMITTALS

A. Division 105 – General Conditions

B. Product Data: Submit data for riprap bags, binder and geotextile fabric.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Riprap: Limestone type; broken stone; solid and nonfriable; class as specified on Drawings.

B. Bags: Woven jute, where shown on Drawings.

C. Binder: Portland cement, not required unless detailed on Drawings.

D. Geotextile Fabric: Non-biodegradable, non-woven, 8 oz. minimum weight.

2.2 BAGGED RIPRAP – **Not Used**

A. Mix riprap, cement, sand and aggregate dry.
   1. Cement: Maximum 10 percent of dry mixed materials by volume.

B. Fill bags with dry ingredients to 70 percent capacity and close by sewing or stapling to straight seam.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Conditions

B. Do not place riprap over frozen or spongy subgrade surfaces.

3.2 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, at embankment slopes, and as indicated on Drawings.

C. Installed Thickness Per Class:
1. Class 1 Thickness = 18”; Tolerance 0”, +6”
2. Class 2 Thickness = 24”; Tolerance -3”, +15”
3. Class 3 Thickness = 30”; Tolerance -3”, +15”
4. Class 4 Thickness = 32”
5. Class 5 Thickness = 36”

3.3 SCHEDULES

A. Culvert Pipe Ends: Loose riprap, placed one layer thick, 18-inch average thickness, extend a minimum of two feet beyond culvert wall in each direction.

B. Sloped Grade: Loose riprap units, 18-inch thickness; placed prior to finish topsoil.

END OF SECTION

SECTION 02374

EROSION CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silt Fences.
   2. Diversion Channels.
   3. Rock Energy Dissipater.
   4. Paved Energy Dissipater.
   5. Rock Basin.
   6. Rock Barriers.
   7. Sediment Ponds.
   8. Sediment Traps.

B. Related Sections:
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
   1. ASTM C127 - Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:
   1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.3 SUBMITTALS

A. Division 105 – General Conditions

B. Product Data: Product Data: Submit data on joint filler joint sealer and geotextile.

C. Submit Erosion Control Plan along with application for Stormwater NPDES permit to Engineer prior to placement of erosion control devices.

D. Submit manufacturer's catalog sheets and other pertinent information on filter fabrics showing that they meet or exceed the requirements of this specification.

1.4 CLOSEOUT SUBMITTALS

A. Division 105 – General Conditions

1.5 ENVIRONMENTAL REQUIREMENTS

A. Division 105 – General Conditions

B. Do not place grout when air temperature is below freezing.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

D. Silt fence should not be installed across streams, ditches, waterways, or other concentrated flow areas.

PART 2 PRODUCTS

2.1 SILT FENCE MATERIALS

A. Geotextile fabric shall be a 36" wide, nonwoven filter fabric composed of polypropylene, polyethylene, ethylene, or polyamide material.

B. Minimum grab strength shall be 100 lbs. in any direction.

C. Apparent opening size shall be 30 (maximum sieve size).

D. Flow rate shall be 25 gallons/minute/square foot.

E. Ultraviolet ray inhibitors and stabilizers shall provide a maximum of 6 months of expected usable life.

F. Type A silt fence shall include a 36" wide, 12-1/2 gauge galvanized wire fence reinforcement to be placed with the geotextile material. Wire fence shall have openings no larger than 6 inches by 6 inches. Type B silt fence shall be a 36" wide fabric with no wire fence reinforcement.

G. Fence posts shall be minimum 2” x 2” oak, 60” long or steel T-post for Type B silt fence. Steel T-posts or 4” x 4” pressure treated wood posts shall be required for Type A silt fence. Minimum bury depth for wood posts is 24 inches.

2.2 ROCK

A. Rock: Sound, hard and angular shape; well graded; without shale seams, structural defects and foreign substances; with width and thickness greater than one third its length. Refer to Section 02371.

2.3 CONCRETE MATERIALS AND REINFORCEMENT

A. Concrete: As specified in Section 03300.

B. Water: Clean and not detrimental to concrete.

C. Reinforcement Steel: As specified in Section 03200.

2.4 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS

A. Precast Solid Concrete Block.

B. Soil Backfill: Soil as specified in Section 02300.

2.5 PLANTING MATERIALS

A. Seeding and Soil Supplements: As specified in Section 02924.

B. Mulch: As specified in Section 02924.

2.6 PIPE MATERIALS

A. Pipe: Corrugated Plastic (HDPE).

2.7 SOURCE QUALITY CONTROL (AND TESTS)

A. Division 105 – General Conditions

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

C. Make rock available for inspection at producer’s quarry prior to shipment. Notify Engineer at least seven days before inspection is allowed.

D. Allow witnessing of inspections and testing at manufacturer’s test facility. Notify Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Conditions

B. Verify location of existing streams, drainage structures and environmentally sensitive areas prior to placing erosion control devices.

C. Verify compacted subgrade, granular base or stabilized soil is acceptable and ready to support devices and imposed loads.

D. Verify gradients and elevations of base or foundation for other work are correct.

3.2 SILT FENCE

A. The silt fence should be purchased in a continuous roll cut to length to avoid the use of joints. When joints are unavoidable, fabric should be spliced together at a post with a minimum 6 inch overlap.

B. Post installation should start at the center of the low point with remaining posts spaced 10 feet apart for Type A and 7 feet apart for Type B fence.

C. Anchor fabric by entrenching the bottom edge in a 6 inch deep trench and backfilling.

D. Hay or straw bales shall be placed at each end of the silt fence.

3.3 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in Section 02924.

D. Mulch seeded areas with hay as specified in Section 02924.

3.4 ROCK ENERGY DISSIPATOR

A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

NCSA Class	Nominal Placement Thickness
R8	48 inches
R7	36 inches
R6	30 inches
R5	24 inches
R4	18 inches
R3	12 inches

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.
   1. Saturate rock with water. Fill voids between pieces with grout, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.
   2. Moist cure grouted rock for at least 3 days after grouting, using water saturated burlap in accordance with Section 03300.

3.5 PAVED ENERGY DISSIPATER

A. Excavate to the required paving depth. Remove loose, unsuitable material below bottom of paving, and then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Place forms and hold reinforcement firmly in position during placing of concrete.

C. Mix, place and finish concrete, as specified in Section 03300.

D. Embed stones or blocks 4 inches in plastic concrete at indicated separation on slopes and channel bottom.

E. Pave in uniform 10 foot lengths or sections.

F. Pave in shorter sections as necessary for closures or curves.

G. Place premolded expansion joint filler, 1/2 inch thick, cut to conform to paving cross sections, at ends of curved sections at intervals of not more than 100 feet, at end of day's work, and where paving is adjacent to rigid structure. Use joint filler with depth of 1/2 inch less than paving depth and press firmly against adjacent concrete.

H. Form intermediate joints between sections, with two thicknesses of bituminous paper cut neatly to paving cross section.

3.6 ROCK BASIN

A. Construct generally in accordance with rock energy dissipator requirements to indicated shape and depth. Rock courses may be placed in several operations but minimum depth of initial course must be 3 feet or greater.

3.7 ROCK BARRIER

A. Determine length required for ditch or depression slope and excavate compact and foundation area to firm, even surface.

B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicated thickness.

3.8 SEDIMENTATION POND

A. Clear and grub storage area and embankment foundation area site as specified in Section 02230.

B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.

C. Install pipe spillway, with anti-seep collar attached, at location indicated.

D. Place forms and reinforcing for concrete footing at bottom of riser pipe with trash rack and anti-vortex device, as specified in Section 03200. Construction of embankment and trench prior to placing pipe is not required.

E. Mix, place, finish, and cure concrete, as specified in Section 03300.

F. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

G. Construct rock basin at outlet end of pipe, as specified in this Section. Place embankment material, as specified in Section 02300. When required, obtain borrow excavation for formation of embankment, as specified in Section 02300.

H. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 02924.

I. Mulch seeded areas with hay as specified in Section 02924.

3.9 SEDIMENT TRAPS

A. Clear site, as specified in Section 02230.

B. Construct trap by excavating and forming embankments as specified in Section 02300.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipater.

E. When required, obtain borrow excavation for formation of embankment, as specified in Section 02300.

F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 02924.

G. Mulch seeded areas with hay as specified in Section 02924.

3.10 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 02924 at 90 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 02924 permanent seeding specifications.

D. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.11 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

B. Sediment should be removed from behind silt fence once it has accumulated to one-half the original height of the barrier. Fabric should be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months).

C. Hay bales shall be replaced every 6 months regardless of condition.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Do not damage structure or device during cleaning operations.

F. Do not permit sediment to erode into construction or site areas or natural waterways.

G. Clean channels when depth of sediment reaches approximately one half channel depth.

END OF SECTION

SECTION 02512

SITE WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for site water line including domestic water line and fire water line.
2. Valves.
3. Hydrants.
4. Positive displacement meters.
5. Backflow preventers.
6. Underground pipe markers.
7. Precast concrete vault.
8. Bedding and cover materials.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:
1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

D. ASTM International:
1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
2. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
6. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

7. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
11. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
12. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

E. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C502 - Dry-Barrel Fire Hydrants.
7. AWWA C504 - Rubber-Sealed Butterfly Valves.
8. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
9. AWWA C515 – Reduced Wall, Resilient-Seated Gate Valves for Water-Supply Service.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C606 - Grooved and Shouldered Joints.
12. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
13. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
14. AWWA C702 - Cold-Water Meters - Compound Type.
15. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
17. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
18. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

G. Underwriters Laboratories Inc.:
1. UL 246 - Hydrants for Fire - Protection Service.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe: AWWA C151:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: AWWA C111, rubber gasket with rods.

B. Copper Tubing: ASTM B88, Type K, annealed:
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

C. PVC Pipe: ASTM D2241, Pressure rating 200 psi:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: ASTM D3139 compression gasket ring.

D. PVC Pipe: AWWA C900 Class 200:
   1. Fittings: AWWA C111, cast iron.
   2. Joints: ASTM D3139 compression gasket ring.

2.2 GATE VALVES

A. Manufacturers:
   1. American Flow Control.
   2. American AVK Company.
   3. M and H Valve Company.
   4. Mueller Company.
   5. Substitutions: Permitted if meeting these specifications.

B. 2-1/2 inches and Smaller: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc.

C. 3 inches and Larger: AWWA C515, ductile iron body, bronze trim, non-rising stem with square nut, rubber encapsulated ductile iron wedge, resilient seat, mechanical joint ends, fusion bonded epoxy coating, triple o-ring stem seals, 250 psi pressure rating.

2.3 BALL VALVES

A. Manufacturers:
   1. American Flow Control.
   2. American AVK Company.
   3. Mueller Company.
   4. Substitutions: Permitted if meeting these specifications.

B. 2 inches and Smaller: Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA, IPS, or compression inlet and outlet ends.

2.4 SWING CHECK VALVES

A. Manufacturers:
   1. American Flow Control.
   2. American AVK Company.
   3. M and H Valve Company.
   4. Mueller Company.
   5. Substitutions: Permitted if meeting these specifications.

B. 2 inches to 24 inches: AWWA C508, cast iron body, bronze trim, full diameter waterway, rubber faced disc, flanged ends, 200 psi working pressure.

2.5 BUTTERFLY VALVES

A. Manufacturers:
   1. American Flow Control.
   2. American AVK Company.
   3. M and H Valve Company.
   4. Mueller Company.
   5. Substitutions: Permitted if meeting these specifications.

B. 2 inches to 24 inches: AWWA C504, cast iron body, bronze disc, resilient replaceable seat, mechanical joint ends.

2.6 HYDRANT

A. Manufacturers:
   1. American Flow Control.
   2. American AVK Company.
   3. M and H Valve Company.
   4. Mueller Company.
   5. Substitutions: Permitted if meeting these specifications.

B. Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 6.125 inches minimum, with minimum 5-1/2 inch diameter valve seat opening; 6 inch bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets.

C. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

D. Hose and Streamer Connection: Match sizes and type of thread with utility company, two hose nozzles, one pumper nozzle.

E. Finish: Primer and two coats of enamel. Color in accordance with fire department requirements.

2.7 POSITIVE DISPLACEMENT METERS

A. Manufacturers:
   1. Schlumberger.
   2. Sensus Water Meters.
   3. Hersey Products.
   4. Substitutions: Permitted if meeting these specifications.

B. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron frost-proof, breakaway bottom cap, hermetically sealed register.

C. Meter: Brass body turbine meter with magnetic drive register.
   1. Service: Cold water.
   2. Accuracy: 98.5 percent.
   3. Maximum Counter Reading: 1 million gallons.
   4. Pipe Size: 3/4 inch.

2.8 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Mueller Company.
   2. Ford Meter Box Company.
   3. A.Y. McDonald Manufacturing.
   4. Substitutions: Permitted if meeting these specifications.

B. Reduced Pressure Backflow Preventers:
   1. Comply with ASSE 1013.
   2. Bronze body, with bronze internal parts and stainless steel springs.

3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

C. Double Check Valve Assemblies: Comply with ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.9 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Main" in large letters.

2.10 PRECAST CONCRETE VAULT

A. Product Description: Precast vault designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

B. Shape: Square or Rectangular with truncated corners as indicated on Drawings.

C. Inside Depth: four feet.

D. Wall Thickness: 5 inches, minimum.

E. Base Section: Include 2 inch deep x 12 inch square sump with floor drain.

F. Top Section: Include 4’ x 6’ double leaf aluminum tread-plate hatch complete with continuous hinges, hold-open arms, hydraulic opener, and locking device.

G. Pipe Entry Locations: As indicated on Drawings.

H. Steps: Polypropylene plastic step with 1/2 inch steel reinforcement12 inches on center vertically.

2.11 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 02300.

B. Cover: As specified in Section 02300.

C. Soil Backfill from Above Pipe to Finish Grade: Soil as specified in Section 02300.

2.12 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03300.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements.

B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

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 BEDDING

A. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to 95 percent density.

C. Backfill around sides and to top of pipe in accordance with Section 02320.

D. Maintain optimum moisture content of fill material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Maintain 5 foot separation of water main from sewer piping.

B. Install pipe to indicated elevation to within tolerance of 1/4 inch.

C. Install ductile iron piping and fittings to AWWA C600.

D. Route pipe in straight line.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints.

F. Install access fittings to permit disinfection of water system performed under Section 02516.

G. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

H. Establish elevations of buried piping with not less than two feet of cover.

I. Install plastic ribbon tape continuous over top of pipe and buried 12 inches below finish grade.

J. Install trace wire continuous over top of pipe and placed 6 inches above pipe.

K. Backfill trench in accordance with Section 02300.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 24 inches away from hydrant.

F. Provide drainage pit 36 inches square by 30 inches deep filled with 2 inch washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 09900.

3.6 INSTALLATION - METERS

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet.

3.7 SERVICE CONNECTIONS

A. Install water meter and backflow preventer in concrete vault located on site.

B. Install water service to 5 feet of building. Connect to building water service.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 02516.

3.9 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements.

B. Perform pressure test on domestic site water distribution system in accordance with AWWA C600.

C. Pressure test system to 200 psi. Repair leaks and re-test.
   1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
   2. Provide equipment required to perform leakage and hydrostatic pressure tests.
   3. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.

4. Conduct hydrostatic test for at least two-hour duration.
5. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
6. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks removed and plug resulting piping openings.
7. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
8. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
9. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

L = allowable, in gallons per hour
S = length of pipe tested, in inches
D = nominal diameter of pipe, in inches
p = average test pressure during leakage test, in pounds per square inch (gauge)

10. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

SECTION 02515

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for domestic water service connections to buildings.
2. Corporation stop assembly.
3. Curb stop assembly.
4. Meter setting equipment.
5. Water meters.
6. Backflow preventers.
7. Underground pipe markers.
8. Bedding and cover materials.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:
1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

D. ASTM International:
1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
4. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
6. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).

7. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
9. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
12. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

E. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
2. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
3. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
4. AWWA C702 - Cold-Water Meters - Compound Type.
5. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
6. AWWA C800 - Underground Service Line Valves and Fittings.
7. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
8. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.3 SUBMITTALS

A. Division 105 – General Conditions

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meters, meter setting equipment, service saddles, backflow preventer, and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Division 105 – General Conditions

B. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Division 105 – General Conditions

B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

D. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 WATER PIPING AND FITTINGS

A. Copper Tubing: ASTM B88, Type K, annealed:
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

B. PVC Pipe: SDR-21 for 200 psig rating:
   1. Fittings: SDR-21 PVC.
   2. Joints: Compression. Solvent weld not acceptable.

C. Polyethylene Pipe: 200 psig pressure rating:
   1. Fittings: AWWA C901, molded.
   2. Joints: Compression.

2.2 CORPORATION STOP ASSEMBLY

A. Manufacturers:
   1. Mueller Company.
   2. Ford Meter Box Co.
   3. A. Y. McDonald Manufacturing.
   4. Substitutions: Section 01600 - Product Requirements.

B. Corporation Stops:
   1. Brass or red brass alloy body conforming to ASTM B62.
   2. Inlet end threaded for tapping according to AWWA C800.
   3. Outlet end suitable for service pipe specified.

C. Service Saddles:
   1. Double strap type, designed to hold pressures in excess of pipe working pressure.

2.3 CURB STOP ASSEMBLY

A. Manufacturers:
   1. Mueller Company.
   2. Ford Meter Box Co.
   3. A. Y. McDonald Manufacturing.
   4. Substitutions: Division 105 – General Conditions

B. Curb Stops:
   1. Brass or red brass alloy body conforming to ASTM B62.
   2. Plug type valve.
   3. Positive pressure sealing.

2.4 METER BOX

A. Refer to Drawing Details

2.5 WATER METERS

A. Refer to Drawing Details

2.6 BACKFLOW PREVENTERS

A. Refer to Drawing Details

EXECUTION

2.7 EXAMINATION

A. Division 105 – General Conditions

B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

2.8 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.

2.9 INSTALLATION - CORPORATION STOP ASSEMBLY

A. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the Engineer.

B. Provide service clamps for mains other than of cast iron or ductile iron mains.

C. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12 inches apart longitudinally and staggered.

D. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.

E. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by the Architect/Engineer.

2.10 BEDDING

A. Excavate pipe trench in accordance with Section 02300 for Work of this Section.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to 95 percent.

C. Backfill around sides and to top of pipe in accordance with Section 02300.

D. Place fill material in accordance with Section 02300.

2.11 INSTALLATION - PIPE AND FITTINGS

A. Group piping with other site piping work whenever practical.

B. Route pipe in straight line.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints.

D. Install access fittings to permit disinfection of water system.

E. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

F. Backfill trench in accordance with Section 02300.

2.12 INSTALLATION - CURB STOP ASSEMBLY

A. Set curb stops on gravel bed and connect to inlet side of meter.

B. Center and plumb meter box over meter/curb stop assembly. Set box cover 1” above finished grade.

2.13 INSTALLATION - WATER METERS

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet.

2.14 INSTALLATION - BACKFLOW PREVENTERS

A. Install backflow preventer on outlet side of each meter and in accordance with manufacturer’s instructions.

2.15 SERVICE CONNECTIONS

A. Install water service in accordance with utility company requirements with double check valve backflow preventer and pressure reducing valves where line pressure exceeds 80 psi.

B. Install water meter and backflow preventer in meter box located on site.

C. Flush and pressure test service line prior to connection of meter.

2.16 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 02510.

2.17 FIELD QUALITY CONTROL

A. Perform pressure test on water distribution system in accordance with Section 02510.

END OF SECTION

SECTION 02630

SITE STORM DRAINAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Site Storm drainage piping.
2. Accessories.
3. Underground pipe markers.
4. Catch basins and plant area drains.
5. Cleanouts.
6. Bedding and cover materials.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - BASIS OF MEASUREMENT

A. Pipe and Fittings:
1. Basis of Measurement: Refer to Division 106 – Scope of Work

B. Catch Basin and Cleanout:
1. Basis of Measurement: Refer to Division 106 – Scope of Work

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
10. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
18. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
19. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
20. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 SUBMITTALS

A. Division 105 – General Conditions

B. Product Data: Submit data indicating pipe, pipe accessories, and precast structures.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, catch basins, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 PRE-INSTALLATION MEETINGS – **Not Required**

A. Division 105 – General Conditions

B. Convene minimum one week prior to commencing work of this section.

1.7 COORDINATION

A. Division 105 – General Conditions

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system, connection to roof drain system, and connection to municipal storm sewer system.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Concrete Pipe: ASTM C14, Class 3; unreinforced; maximum inside nominal diameter of 12 inches, bell and spigot ends.
   1. Fittings: Concrete.
   2. Joints: ASTM C443, rubber compression gasket joint.

B. Reinforced Concrete Pipe: ASTM C76, Class III with Wall Type B; mesh reinforcement; bell and spigot ends.
   1. Fittings: Reinforced concrete.
   2. Joints: ASTM C443, rubber compression gasket.

C. Plastic Pipe:
   1. ASTM D3034, Type PSM, Polyvinyl Chloride (PVC) material; bell and spigot style rubber ring sealed gasket joint.
      a. Fittings: PVC.
      b. Joints: ASTM F477, elastomeric gaskets.
   2. ASTM F2648, HDPE plain end pipe shall have a smooth interior and annular exterior corrugations. 4- through 60-inch (100 to 1500 mm) pipe shall meet ASTM F2648. Manning's "n" value shall be 0.012

D. Corrugated Steel Pipe: plain end joints; helical lock seam; coated inside and out with 0.050-inch-thick bituminous coating.
   1. Fittings: Corrugated steel.
   2. Joints: Corrugated steel pipe coupling bands, galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.2 ACCESSORIES

A. Filter Fabric: Non-biodegradable, non-woven.

B. Grout: Specified in Section 03300.

2.3 CATCH BASINS AND PLANT AREA DRAINS

A. Catch Basin/Inlet Construction:

1. Concrete block and mortar.
2. Cast-in-place reinforced concrete.
3. Pre-cast concrete.
4. Polyethylene.
5. Substitutions: Refer to Division 105 – General Conditions.

B. Catch Basin/Inlet Lid and Frame:
1. Construction: Cast iron.
2. Load Design: Traffic rated unless otherwise shown on Drawings.
3. Lid Shape: Round Junction Box Lid; Square or Rectangle Inlet Lid; As shown on Drawings.

C. Base Pad: Cast-in-place concrete of type specified in Section 03300.

2.4 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type A2 as specified in Section 02060.

B. Cover: Fill Type: Fill type A2, as specified in Section 02060.

C. Soil Backfill from Above Pipe to Finish Grade: Soil type as specified in Section 02300

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Conditions

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02324 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on minimum 6-inch-deep bed of Type A2 filter aggregate.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 100 feet.

D. Install aggregate at sides of pipe.

E. Refer to Section 02320 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

F. Connect to building downspouts where required. Coordinate with architectural plans.

G. Connect to subdrainage tile system piping. Coordinate with architectural plans.

H. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system. Coordinate with architectural plans.

3.5 INSTALLATION - CATCH BASINS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections.

C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.6 FIELD QUALITY CONTROL

A. Division 105 – General Conditions

B. Request inspection prior to placing aggregate cover over pipe.

C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Infiltration Test: Test in accordance with ASTM 969.

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

SECTION 02721

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base course.

B. Related Sections:
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Division 105 – General Requirements

B. Materials Source: Submit name of materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Crushed Aggregate Base: As specified in Alabama Department of Transportation, Standard Specifications for Highway Construction, Latest Edition, Section 301-A and Section 825.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Requirements

B. Verify subbase has been inspected, proof-rolled, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Spread aggregate over prepared substrate to the total compacted thickness as shown or indicated in the Drawings.

B. Place aggregate in maximum 6-inch layers and compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Division 105 – General Requirements

B. Maximum Variation from Flat Surface: 1/4 inch measured with 10 foot straight edge.

C. Maximum Variation from Thickness: 1/2 inch.

D. Maximum Variation from Elevation: 0.05 feet.

3.5 FIELD QUALITY CONTROL

A. Division 105 – General Requirements

B. Compaction testing will be performed in accordance with ASTM D1556.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests:
   1. Road: 1 test per 300 linear feet per lift.
   2. Parking Area: 1 test per 1,500 square feet per lift.

3.6 SCHEDULES

A. Under Asphalt Pavement:
   1. Compact placed aggregate materials uniformly to achieve minimum 98 percent of maximum density.

B. Under Concrete Pavement:
   1. Compact placed aggregate materials uniformly to achieve minimum 98 percent of maximum density.

END OF SECTION

SECTION 02740

FLEXIBLE PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Asphaltic concrete paving, wearing, binder and base course.
2. Surface sealer.
3. Aggregate subbase course.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. Asphalt Institute:
1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.

B. ASTM International:
1. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
2. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

1.3 PERFORMANCE REQUIREMENTS

A. Paving: Designed for streets, drives and parking areas.

1.4 SUBMITTALS

A. Division 105 – General Requirements

B. Product Data: Submit product information and mix design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Alabama Department of Transportation standard.

B. Mixing Plant: Conform to Alabama Department of Transportation Standard.

C. Obtain materials from same source throughout.

D. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Division 105 – General Requirements

B. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

C. Place bitumen mixture when temperature is not more than 15 degrees F below temperature at when initially mixed and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Binder Course: In accordance with Section 424-B "Superpave Bituminous Concrete Binder Layer, 3/4-inch maximum aggregate size mix, ESAL range A/B" of the Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

B. Wearing Surface Layer: In accordance with Section 424-A "Superpave Bituminous Concrete Wearing Surface Layer, 1/2-inch maximum aggregate size mix, ESAL range A/B" of the Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

C. Tack Coat: In accordance with Section 405 "Tack Coat" of the Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

2.2 SOURCE QUALITY CONTROL AND TESTS

A. Division 105 – General Requirements

B. Submit proposed mix design for review prior to beginning of Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 105 – General Requirements

B. Verify compacted subbase is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Verify drainage facilities, manhole frames, water valves, and other utility structures are installed in correct position and elevation.

3.2 PREPARATION - PRIMER

A. Apply primer in accordance with ALDOT specifications.

B. Use clean sand to blot excess primer.

3.3 PREPARATION - TACK COAT

A. Apply tack coat in accordance ALDOT specifications.

B. Apply tack coat on asphalt and concrete surfaces over subgrade surface at uniform rate.

C. Apply tack coat to contact surfaces of curbs, gutters and concrete driveway turnouts.

D. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.4 PLACING ASPHALT PAVEMENT

A. Place asphalt binder course within 12 hours of applying primer or tack coat.

B. Place binder course to thickness identified in schedule at end of section.

C. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

D. Place wearing course to thickness identified in Drawings.

E. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.5 TOLERANCES

A. Division 105 – General Requirements

B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

C. Scheduled Compacted Thickness: Within 1/4 inch.

D. Variation from Indicated Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

A. Division 105 – General Requirements

B. Take samples and perform tests in accordance with ASTM D1556.

C. Frequency of Tests:
   1. Road: 1 test per 300 linear feet.
   2. Parking Area: 1 test per 1,500 square feet.

3.7 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect pavement from mechanical injury for 4 hours or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 02763

PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Traffic lines and markings.
2. Legends.
3. Paint.
4. Glass beads.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Traffic Lines:
1. Refer to Division 106 – Scope of Work

B. Markings:
1. Refer to Division 106 – Scope of Work

C. Legends:
1. Refer to Division 106 – Scope of Work

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. ASTM International:
1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Using the Stormer Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.

9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
11. ASTM D2202 - Standard Test Method for Slump of Sealants.
12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids from Solvent-Reducible Paints.
14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

1.4 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.5 SUBMITTALS

A. Refer to Division 105 – General Conditions

B. Product Data: Submit paint formulation for each type of paint.

C. Samples:
1. Submit samples of glass bead in compliance with AASHTO M247.

D. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.

E. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing work of this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Division 105 – General Conditions: Requirements for transporting, handling, storing, and protecting products.

B. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

C. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Refer to Division 105 – General Conditions: Environmental conditions affecting products on site.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Do not apply paint when temperatures are expected to fall below 50 degrees F for 24 hours after application.

E. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.9 WARRANTY

A. Furnish one-year manufacturer's warranty for traffic paints.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of traffic paints for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Manufacturers:
1. Pervo Paint Company.
2. Pathmark Traffic Products.
3. Safety Coatings Inc.
4. Substitutions: Division 105 – General Conditions.

B. Paint: Ready mixed, conventional and fast dry waterborne traffic paints, lead-free, non-toxic, NASSHTO Test Deck, minimum retroreflectance of 100 mcds, durability rating of 6 or more after in place for 9 months; within following limits:
1. Pigment, percent by weight: 60 plus or minus 2.
2. Vehicle, percent by weight: 40 plus or minus 2.
3. Non-Volatile, percent by weight of paint: 76.0.

4. Weight per gallon, pounds minimum 13.0.
5. Viscosity: 80-95 Kreb Units at 77 degrees F.
6. Grind (Hegeman Gauge), minimum Field Tested no tracking time under ambient conditions: 20-90 seconds.
7. Dry Through Time, 15 mils wet at 90 percent relative humidity, 72 degrees F, ASTM D1640: 125 minutes maximum.
8. VOC (Volatile Organic Content): One lbs/gal maximum.

C. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

2.2 EQUIPMENT

A. Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.
1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.
4. Device to heat paint to 120 degrees F for fast dry applications.

B. Machine Calibration:
1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.

C. Other Equipment:
1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SOURCE QUALITY CONTROL

A. Refer to Division 105 – General Conditions: Testing, inspection and analysis requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Refer to Division 105 – General Requirements: Verification of existing conditions before starting work.

B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Maintenance and Protection of Traffic:
   1. Provide short term traffic control in accordance with Section 01500.
   2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
   3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.
   4. Maintain access to existing businesses, residences, and other properties requiring access.

B. Surface Preparation.
   1. Clean and dry paved surface prior to painting.
   2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
   3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
   4. Notify Engineer after placing pavement spots and minimum 3 days prior to applying traffic lines.

3.3 EXISTING WORK

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with black paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing remaining or reinstalled lines and legends.

3.4 APPLICATION

A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.

B. Dispense paint at ambient 120 degrees F to wet-film thickness of 15 mils, except dispense edge markings to wet-film thickness of 12 mils.

C. Apply glass beads at rate of 6 pounds per gallon of paint.

D. Apply markings to indicated dimensions at indicated locations.

E. Prevent splattering and over spray when applying markings.

F. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.

G. Collect and legally dispose of residues from painting operations.

3.5 APPLICATION TOLERANCES

A. Refer to Division 105 – General Requirements: Tolerances.

B. Maximum Variation from Wet Film Thickness: 1 mil.

C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

D. Maintain cycle length for skip lines at tolerance of plus or minus 6 inches per 40 feet and line length of plus or minus 3 inches per 10 feet.

E. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.6 FIELD QUALITY CONTROL

A. Refer to Division 105 – General Requirements.

B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Repair lines and markings, which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
   3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

D. Replace defective pavement markings as specified throughout one year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner’s painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.

E. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.

F. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:
   1. Average retro reflectivity within any 528-foot section is less than 1225 mcd/m2/1x for white pavement markings and 100 mcd/m2/1x for yellow pavement markings.
   2. Marking is discolored or exhibits pigment loss and is determined to be unacceptable by three-member team based on visual comparison with beaded color plates.
   3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528-foot section of roadway is missing.

G. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original warranty period even when replacement materials have been installed as specified.

H. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers and repair any damage.

I. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 SCHEDULES

	ITEMS	LOCATION
A.	4 inch White Conventional	Edge
B.	4 inch White Fast Dry	Edge
C.	24 inch White Fast Dry	Stop Line
D.	4 inch Yellow Conventional	Center
E.	4 inch Yellow Fast Dry	Center
F.	4 inch Blue Conventional	Center

END OF SECTION

SECTION 02910

ATHLETIC FIELD ROOT ZONE & DRAINAGE LAYER MEDIA

PART 1 GENERAL

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

1.2 SUMMARY:

A. The work under this Section will include, but not necessarily be limited to, the following, all complete and in accord with the Drawings and Specifications:

1. Provision of materials required to prepare root zone and transporting root zone media to be spread.
2. Subgrade preparation.
3. Placing and spreading root zone media, compaction of root zone media and finish and fine grading as required.
4. Provision all materials, equipment, labor, services and incidentals as required to install a system of athletic field subsurface drainage piping, drainage layer media and related items.
5. Grade subgrade, drainage layer and root zone media utilizing laser activated/controlled equipment from off-board transmitter to achieve accurate equipment blade positioning.
6. Testing as specified and/or required.

B. Related Work includes:

1. Section 03284 – Landscaping Irrigation
2. Section 02926 – Athletic Field Sodding and Maintenance
3. Section 02300 - Earthwork

1.3 SUBMITTALS:

A. When requested by the engineer, submit the following contractor qualifications for the work of this section:

1. A list providing specific contacts and telephone numbers for five (5) completed Sand-based athletic field projects.
2. Resume of installation supervisor with a minimum of five (5) years experienced who will be present on site during installation, including a list of installations and qualifications of the workers.

B. Test Results: Submit physical and chemical criteria of root zone and drainage media along with bridging tests once proper soil amendment has been achieved or identified. Maintain one (1) copy of all test results on-site for reference.

C. Product Data: Submit manufacturer's product literature, instructions and guaranteed analysis for fertilizer, lime and root zone and drainage layer media (sand and gravel).

1.4 QUALITY ASSURANCE:

A. ASTM Standard Test Methods:
1. F2396 - Standard Guide for High Performance Sand- Based Rootzones for Sports Fields
2. F1815 - Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, and Bulk Density of Athletic Field Rootzones.
3. D5550 - Standard Test Method for Specific Gravity of Soil Solids by Gas Pycnometer.
4. F1647 - Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes, Method A
5. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
6. F1632 - Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes
7. D4972 - Standard Test Method for pH of Soils, Method A

1.5 JOB CONDITIONS:

A. Dust Control:
1. Use all means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the Work or if resulting from the condition in which the Contractor leaves the site.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public and concurrent performance of other work on site.

B. Protection:
1. Use all means necessary to protect all materials of this Section before, during and after installation; to protect all objects designated to remain, existing construction and to protect the public.
2. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 MATERIALS

2.1 ROOT ZONE MEDIA

A. General

1. Root Zone Media shall be subject to the approval of the Engineer at all times.
2. Provide Root Zone Media shall be free of noxious weeds, grasses, seeds, plants, roots, branches, sticks, extraneous matter, and any substance harmful to plant growth.

B. Physical Criteria: Furnish Root Zone Media for use under this specification section meeting the following physical criteria:

1. Well blended combination of sand and sandy loam to achieve a final sand content with total "fines" (very fine sand, silt, & clay) of less than (<) 10%.
2. Root Zone Media Physical Properties:

Saturated Hydraulic Conductivity	8 – 15 in/hr.

3. Root Zone Media Chemical Properties:

Calcium Carbonate Equivalent	< 5%
Final Ph	6.0-6. 6

C. Sand Particle Gradation: Furnish Root Zone Media for use under this specification section meeting the following gradation:

1. Combination of medium and coarse sand meeting current United States Golf Association (USGA) recommendations for a rootzone mix.
2. Coefficient of Uniformity (D_{60} / D_{10}): 1.8 – 4.0

D. Prepare rootzone mix as follows:

1. Use soil blending equipment and machinery specifically manufactured for that purpose to amend native soil and/or place premixed root zone to the design depth as indicated on drawings. Achieve a truly homogeneous and uniform mixture throughout the entire mass of materials.

2.2 DRAINAGE LAYER MEDIA

A. General:

1. Drainage Layer Media shall be subject to the approval of the Engineer at all times.
2. Provide Drainage Layer Media free of all deleterious materials, noxious weeds, grasses, seeds, plants, roots, branches, sticks, extraneous matter and any substance harmful to plant growth.

B. In addition to complying with Article 2.1 A., provide Drainage Layer Media aggregate conforming to the following:

1. Crushed Silica Gravel or Granite containing less than 10% carbonate with a Uniformity coefficient <2.5 and meeting the following graduation:

Percentage passing size:	
12.5mm (1/2 inch)	100%
9.5mm (3/8 inch)	90-100%
2mm	<10%
1mm	<5%

2. ALDOT No. 89 Washed Stone with Sand to Gravel Bridging Capabilities

3. 1/4" X 3/8" Washed Pea Gravel with Sand to Gravel Bridging Capabilities

2.3 TESTING

A. Provide access to Root Zone Media material stockpiles for Owner's review prior to delivery onsite. Provide testing for all samples.

B. Test samples of root zone and drainage layer media for compliance with specified characteristics and bridging compatibility.

C. A minimum of three (3) initial sample mixes of Root Zone Media is to be prepared and tested by the testing laboratory for approval.

D. Approved Testing Laboratories:

Tifton Physical Soil Testing Laboratory
1412 Murray Avenue
Tifton, Georgia 31794

E. Following initial testing and approval for use, root zone and drainage layer media placed on the project is to be sampled and tested as specified above at random as directed by the Engineer. Every five hundred (500) tons of each media type placed is to be tested for physical properties prior to arrival at the project site.

2.4 PLASTIC PIPE

A. Solid Drain Pipe:

1. Advanced Drainage Systems, (ADS) N12, smooth interior wall corrugated polyethylene pipe. Diameters as shown on the Drawings. Furnish complete

with bends, adapters, couplings, collars, fittings and joint materials.

2. Approved substitute.

B. Perforated Drain Pipe:

1. Advanced Drainage Systems, (ADS) N12, smooth interior wall corrugated, perforated class II (slot), polyethylene pipe. Diameters as shown on the Drawings. Furnish complete with bends, adapters, couplings, collars, fittings, and joint materials.
2. Approved substitute.

2.5 FERTILIZER: See Athletic Field Drainage Section Detail per Project Plans.

2.6 LIME: See Athletic Field Drainage Section Detail per Project Plans.

2.7 PRE-EMERGENT HERBICIDE: See Athletic Field Drainage Section Detail per Project Plans.

2.8 OTHER MATERIALS: Provide all other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Engineer.

PART 3 EXECUTION

3.1 GENERAL

A. Prior to all work of this Section, the contractor shall become thoroughly familiar with the site, site conditions, and all portions of the Work falling within this Section.

B. Prior to all work of this Section, the contractor shall inspect all areas of the site. Check existing subgrade elevations, lines, grades, conditions to assure specified root zone media and drainage layer media depths and final finished grades. Confirm all findings requiring correction to the Engineer in writing. Do not proceed with work until corrective measures have been taken. Failure of the Contractor to comply with this requirement will be construed, as the Contractor having accepted existing subgrade and the Contractor at no cost will make any necessary or required corrective measures to the Owner.

C. Operations Prior to Approvals

1. Do not allow or cause any work to be performed or installed to be covered or enclosed by work of this Section prior to all required inspections, tests and approvals.
2. Should any work be so enclosed or covered before it has been approved, uncover at no additional cost to the Owner.
3. After work has been completely tested, inspected, and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

3.2 FIELD PREPARARION

A. Grade areas as shown on plans. Bring areas to uniform grade, allow for root zone media and drainage layer media. Maintain positive drainage on all surfaces.

B. Refer to Drawings for layout, quantities, locations and adjacent materials.

C. Subsurface Preparation:

1. Scarifying: After the site has been cleared, stripped, grubbed, undercut and excavated to the specified depths for recompact ion, scarify the exposed surface to a minimum depth of six inches, thoroughly moisture-condition, and compact to the requirements specified for fill below.
2. Leveling: Remove all ruts, hummocks and other uneven surfaces by surface grading prior to placement of fill.
3. Laser grade areas as shown on plans to a tolerance of one-quarter inch per ten linear feet (¼"/ 10'). Bring areas to uniform grade. Allow for root zone media and drainage layer. Maintain positive drainage on all surfaces. Finished subgrade elevations to provide consistent slope and depth of drainage layer as shown on drawings.
4. Compact subgrade to 95% Standard Proctor Density.
5. In accordance with Section 02300.

D. Trenching/Subgrade Shaping:

1. Perform all trenching and subgrade shaping as required for the installation of the work of this Section.
2. Trench and shape as shown on the Drawings and as required for joining, backfilling and compacting.
3. Depth: As required to provide the elevations called for on the Drawings. Where elevations are not shown on the Drawings, trench and shape to sufficient depth to provide positive system drainage.
4. Correction of faulty grades: Where excavation is inadvertently carried below proper elevations, backfill with material approved by the Engineer and then compact to provide a firm and unyielding subgrade and/or foundation to the approval of the Engineer and at no additional cost to the Owner.

E. Drainage Pipe and Fittings:

1. Install pipe in accord with manufacturer's instruction and as specified herein
2. Lay pipe as detailed and shown on the Drawings, true to line and grade.
3. Install couplings, fittings and other appurtenances as required or detailed to tie to proposed pipe network.
4. Terminate pipe as shown on Drawings. Remove burrs, rough and/or torn edges from cuts as directed.
5. Certify subsurface drainage was successfully tested before covering. Contractor shall sign certification.

F. Drainage Media Fill:
   1. Place drainage media fill as detailed and required, using care not to damage or displace pipe.
   2. Install to assure complete cover of pipe. Leave no voids around pipe and compact to preclude settlement. Do not crush pipe.

3.3 FIELD PREPARATION AND INSTALLATION

A. Laser grade areas as shown on plans. Bring areas to uniform grade. Allow for root zone mix. Maintain positive drainage on all surfaces.

B. Use soil blending equipment and machinery specifically manufactured for that purpose to amend native soil and/or place premixed root zone to the design depth as indicated on drawings. Achieve a truly homogeneous and uniform mixture throughout the entire mass of materials. Truck mixed soil to site in covered vehicles and place mix in the center of field. Spread mix from the center to the edges.

C. Place premixed soil mix to the depth and extent indicated on the drawings.

D. Care shall be taken to protect drainage system layers during placement of mix by using boards or mats as travel surfaces for vehicles.

E. Add fertilizer per Project Plans.

F. The amended soil shall be settled, firmed and smoothed, using mechanical means until a uniform firmness is achieved. Rollers are not acceptable. The final grade shall be established by laser grading methods and the field leveled by floating, matting or dragging to achieve smoothness over the entire area to be grassed. Apply water with fine spray to finished surface to moisten the top 3" of soil mix and provide final settlement. Do not over compact.

G. A final pH of 6.0-6.6 is required. Add lime as required to produce final pH.

H. Apply pre-emergent herbicide at manufacturer's recommended rate.

I. The surface shall be approved by the Engineer prior to grassing. Apply water with fine spray to finished surface to moisten the top 3" of soil mix and provide final settlement.

3.3 TREATMENT AFTER COMPLETION OF GRADING

A. After final grading is complete permit no further grading except with the approval of and observation of the Engineer.

B. Use all means necessary to prevent erosion of or damage to completed areas during construction and until final acceptance of the work

END OF SECTION

SECTION 02924

SEEDING AND SOIL SUPPLEMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation of subsoil.
2. Placing topsoil.
3. Seeding and Hydroseeding.
4. Mulching.
5. Soil testing and fertilizer.
6. Maintenance.

B. Related Sections:
1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grassing and Restoration:
1. Basis of Measurement: Lump Sum or Per Acre.
2. Basis of Payment: Includes all labor, material, and equipment required to finish grading to smooth surface, applying topsoil in 4” thickness, either saved from initial stripping operations, or provided from offsite locations, applying fertilizer, seeding of all areas disturbed by the construction activities, applying mulch to seeded areas and maintenance of disturbed areas until stand of grass acceptable to Engineer and/or Owner is established.

1.3 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

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, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS

A. Section 01330 - Submittal Procedures.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

1.6 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.8 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum five years experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 COORDINATION

A. Section 01300 - Administrative Requirements.

B. Coordinate with installation of underground sprinkler system piping and watering heads.

1.11 MAINTENANCE SERVICE

A. Section 01700 - Execution Requirements.

B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition.

PART 2 PRODUCTS

2.1 PLANTING SCHEDULE

1. Established lawns and residential areas shall utilize the following schedule:

RATE – (LB/ACRE)	FROM	TO	SEED
30	March 1	May 1	Kentucky 31
20	April 1	August 1	Common Bermuda
30	August 1	November 1	Kentucky 31 Fescue and Unhulled Bermuda
20	November 1	March 1	Annual Rye

2. Unimproved areas may utilize the following schedule:

Planting Dates	March 1 to May 15	May 16 to August 1	March 1 to May 15	Sept. 1 to Nov. 15
Hulled Bermuda Grass	15	20	10	-
Unhulled Bermuda	10	-	10	-
Tall Fescue	-	-	50	50
Annual Lespedeza	-	30	-	-
Reseed Crimson Clover	-	-	30	-

2.2 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

B. Topsoil: Excavated from site and free of weeds where approved by Engineer.

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. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

C. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

D. Erosion Fabric: SC150 BN by North American Green or Equal,
   1. 70% straw, 30% coconut fiber mat.
   2. Longevity: up to 18 months.
   3. Blanket covered top and bottom with 100% biodegradable woven natural fiber netting.
   4. Shall meet type 3.8 Specification of Erosion Contro Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 4 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.4 FERTILIZING

A. Apply fertilizer at application rate recommended by soil analysis.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine used to apply seed.

D. Mix fertilizer thoroughly into upper 2 inches of topsoil.

E. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.5 SEEDING

A. Apply seed at rate of 5.5 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. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

D. Immediately following seeding, apply mulch to thickness of 1/4 inches. Maintain clear of shrubs and trees.

E. Apply water with fine spray immediately after each area has been mulched. Saturate top 4 inches of soil.

3.6 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate established by manufacturer.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.7 SEED PROTECTION

A. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

END OF SECTION

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SECTION 02926

ATHLETIC FIELD SODDING AND MAINTENANCE

PART 1 GENERAL

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

1.2 SUMMARY:

A. Labor, materials, and equipment necessary to prepare surface and provide and install solid sod grass on the area defined as the “Athletic Field Playing Surface” per Drawings.

B. Areas to be Solid Sodded: “Athletic Field Playing Surface” as shown on the Drawings are to be solid sodded in accordance with this Specification. For the purpose of this Specification, the term "field" shall mean all items designated to receive athletic field solid sodded.

C. Refer to Architectural Specification Section 02938 - Grass Sodding for sodding in areas outside of that defined as the “Athletic Field Playing Surface” per Drawings.

D. Maintenance as required establishing turf.

E. Maintenance after acceptance of 100% establishment as defined herein until Owner's occupancy.

F. See Drawings for other requirements or conditions.

G. Related Work includes:
1. Section 02910 - Athletic Field Root Zone and Drainage Media.
2. Architectural Section 03284 - Landscaping Irrigation

1.3 SUBMITTALS:

A. At time of Bid, submit the following contractor qualifications for the work of this section:
1. A list providing specific contacts and telephone numbers for five (5) completed sand-based athletic field projects.
2. Resume of installation supervisor with a minimum of five (5) years experienced who will be present on site during installation, including a list of installations and qualifications of the workers.

B. Sod Provider: Submit complete maintenance program from sod provider for a six (6) month period prior to harvest for the work of this section. Include schedule and rate of fertilizer, pesticide and herbicide applications.

C. Certification: Certificate from sod provider certifying genetic identity and purity of the turf and freedom from noxious or objectionable weeds.

D. Maintenance Schedule: Submit a written schedule outlining all sodding and maintenance operations for the duration of the project and post completion. Schedule shall be updated on weekly basis, along with a written report of job progress

1.4 QUALITY ASSURANCE:

A. Codes and Standards:
1. Perform sodding operations per Section V of Turfgrass Producers International (TPI) Guideline Specifications to Turfgrass Sodding, revised 1995.
2. Perform operations necessary to establish a completely sodded area free of weeds and other foreign growth.
3. Submit to the Engineer schedule outlining all sodding and maintenance operations for the duration of the project. Schedule shall be updated on weekly basis, along with a written report of job progress. Three copies of schedule and weekly updates are required

1.5 JOB CONDITIONS:

A. Dust Control:
1. Use all means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the Work or if resulting from the condition in which the Contractor leaves the site.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public and concurrent performance of other work on site.

B. Protection:
1. Use all means necessary to protect all materials of this Section before, during and after installation; to protect all objects designated to remain, existing construction and to protect the public.
2. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect and at no additional cost to the Owner.

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PART 2 MATERIALS

2.1 WATER

A. Water for use under this Contract shall be fresh, free from oil or any other impurity or substance harmful to the Work or to plant materials and sod. The Contractor shall make, at his expense, whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs of this Contract. He shall also furnish all necessary hose, equipment, attachments, and accessories as may be necessary to complete the Work as specified.

2.2 SOLID SOD

A. Sod shall conform to the following:
   1. Furnish sod grown for a minimum of twenty-four (24) months.
   2. Furnish sod grown in light sandy loam to match proposed root zone.
   3. Furnish sod in rolls measuring, at minimum , 30 inches in width; length, as practicable for ease of handling, but in no case shorter than 6 feet.
   4. Label rolls as so they are clearly identified for use on the "Athletic Field Playing Surface" only.

B. Sod species shall be certified 'Tifway 419' Bermudagrass (Cynodon dactylon).

C. Provide access to Owner for review w of sod growing location. Owner may review sod, growing media and maintenance practices prior to acceptance.

PART 3 EXECUTION

3.1 GENERAL

A. Familiarization: Prior to all work of this Section, become thoroughly familiar with the site, site conditions, and all portions of the Work falling within this Section.

B. Inspection: Prior to all work of this Section, inspect all areas of the site in the presence of the Engineer. Check existing subgrade elevations, lines, grades, conditions to assure specified root zone media and drainage layer media depths and final finished grades. Confirm all findings requiring correction to the Engineer in writing. Do not proceed with work until corrective measures have been taken. Failure of the Contractor to comply with this requirement will be construed, as the Contractor having accepted existing subgrade and the Contractor at no cost will make any necessary or required corrective measures to the Owner.

C. Operations Prior to Approvals
   1. Do not allow or cause any work to be performed or installed to be covered or enclosed by work of this Section prior to all required inspections, tests and approvals.
   2. Should any work be so enclosed or covered before it has been approved, uncover at no additional cost to the Owner.
   3. After work has been completely tested, inspected, and approved, make all

repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

3.2 SOLID SODDING

A. General:

1. Sodding Season: As outlined in the project schedule and as approved by the Engineer. Do not place immediately following rain, or when ground is too dry, frozen or during windy periods.
2. Damage to Sodded Areas: At all times from beginning of construction to sodding acceptance, Contractor shall provide protection for Work and shall repair damage occurring to solid sod and grades during above stated period.

B. Sod Installation:

1. Place solid sod as follows:
   a. Fine rake finished grade to provide smooth finished surface.
   b. Place sod on completed planting surface utilizing suitable equipment for placing rolled sod. Remove netting during installation operation.
   c. Tightly butt edge of sod rolls. Place rolls with alternating joints.
   d. Hand water as required after sod has been placed and until irrigation station can be utilized.
   e. Locate and trim sod around all irrigation heads, valve boxes and quick coupler boxes at time of sod installation.
2. Roll sodded areas to bond sod to soil and smooth out rough spots.
3. Water as required.
4. Completed sod surface shall be smooth, free of irregularities, conform to the grades and lines specified, and acceptable to the Engineer.

3.3 FIELD ESTABLISHMENT AND MAINTENANCE

A. Water field as needed to keep sod damp. Provide all equipment, personnel, and appurtenances required for watering operations.

B. Fill ruts, runnels, and other such surface inequities with specified soil mix, tamp, level, and replant. Remove hummocks, high points and other such surface inequities, tamp level, and replant.

C. Remove all rocks, pebbles and any debris from the finished surface.

D. Continue to fill depressions and voids and remove high points to achieve pool table smoothness. Following establishment of turf, top dress field with 1/4" depth root zone mix`, on a weekly basis, to remove depressions and voids until acceptance. Drag topdressing into turf.

E. Water as required preventing turf and soil from drying out.

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3.4 FINAL INSPECTION AND ACCEPTANCE

A. Upon completion of required and replacements, the Engineer will confirm date of final acceptance of the work.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Reinforcing bars.
   2. Welded wire fabric.
   3. Reinforcement accessories.

B. Related Sections:
   1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.
   3. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
   7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
   10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
   11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.

C. American Welding Society:
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Refer to Division 105 – General Conditions

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 301.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Refer to Division 105 – General Conditions

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished.

B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704/A704M, ASTM A615/A615M, Grade 60; steel bars or rods, unfinished.

C. Stirrups Steel: ASTM A82, unfinished.

D. Welded Steel Wire Fabric: ASTM A497 Deformed Type; in flat sheets or coiled rolls; galvanized finish.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic tipped steel type; size and shape to meet Project conditions.

D. Reinforcing Splicing Devices: Exothermic welding type; full tension and compression; sized to fit joined reinforcing.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcement as follows:

Item	Coverage
Concrete in contact with soil	3 inches
Exterior concrete	
Bars larger than No. 5	2 inches
No. 5 bars and smaller	1-1/2 inches
Interior concrete	
Bars larger than No. 11	1-1/2 inches
No. 11 bars and smaller	3/4 inch
Stirrups	1-1/2 inches

E. Conform to applicable code for all other conditions.

F. Splice reinforcing in accordance with splicing device manufacturer’s instructions.

G. Lap length shall be as follows unless otherwise noted on the Drawings:

Bar Size	Lap Length
No. 3	12 inches
No. 4	12 inches
No. 5	15 inches
No. 6	18 inches
No. 7	24 inches
No. 8	30 inches

3.2 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements; Section 01700 - Execution Requirements.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   A. Cast-in-place concrete.
   B. Formwork.
   C. Reinforcing.
   D. Mix Design.
   E. Control, expansion and contraction joint devices.
   F. Placement procedures.
   G. Finishes.
   H. Testing requirements.

B. Related Documents:
   A. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.
   B. Refer to Architectural and Structural Specifications for requirements relating to building slabs.

1.2 REFERENCES

A. American Concrete Institute:
   A. ACI 301 - Specifications for Structural Concrete.
   B. ACI 305 - Hot Weather Concreting.
   C. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   D. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   B. ASTM C33 - Standard Specification for Concrete Aggregates.
   C. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   D. ASTM C150 - Standard Specification for Portland Cement.
   E. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   F. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
   G. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
   H. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
   I. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
   J. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
   K. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

L. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
M. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
N. ASTM D1190 - Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type.
O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
P. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
Q. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
R. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Basis of Measurement: Refer to Division 106 – Scope of Work

1.4 SUBMITTALS

A. Refer to Division 105 – General Conditions

B. Product Data: Submit data on joint devices, attachment accessories, and admixtures.

C. Design Data:
A. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
a. Hot and cold weather concrete work.
b. Air entrained concrete work.
B. Identify mix ingredients and proportions, including admixtures.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.5 CLOSEOUT SUBMITTALS

A. Refer to Division 105 – General Conditions

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY CONTROL / QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of each document on site.

C. Acquire cement and aggregate from one source for Work.

D. Conform to ACI 305 when concreting during hot weather.

E. Conform to ACI 306.1 when concreting during cold weather.

F. Concrete Testing Service: Contractor shall employ of a qualified geotechnical engineering, inspection, and testing firm to provide quality control assurance testing during construction Contractor is responsible to provide suitable quality control of materials, procedures, and of the mix design process to ensure the concrete conforms to the project plans and specifications. Submit quality control plan and proposed concrete mix designs to Engineer prior to concrete placement.

1.7 COORDINATION

A. Refer to Division 105 – General Conditions

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.
   A. Use overlaid plywood complying with U.S. Product Standard PS-1 “A-C or B-B High Density Overlaid Concrete Form”, Class 1.
   B. Use plywood complying with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class 1, Exterior Grade or better, mill-oiled and edge sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for a tight fit.

C. Form Coatings: Provide commercial formulation form coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A185 welded steel wire fabric.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar type supports complying with CRSI specifications.

A. For slabs-on-grade use supports with sand plates or horizontal runners where base material will not support chair legs.
B. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, class 1) or stainless steel protected (CRSI, class 2).
C. For sand blasted or intentionally roughened concrete surfaces, provide supports of stainless steel (CRSI, class 2).

D. Reinforcing Bars to be Welded: ASTM A706, "Specifications for Low Alloy Steel Deformed Bars for Concrete Reinforcement".

E. Bar and Rod Mats: ASTM A184 "Specifications for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement".

F. Threaded Dowels: Continuous Threaded high-strength steel bars. Provide inserts compatible with dowels, designed for ultimate pull-out force indicated on the Drawings.

G. Mechanical Splices: Equal to "Cadweld Rebar Splices", as manufactured by Erico Products, Inc., "C" Series, for developing 125% of minimum ASTM specified yield strengths, unless otherwise noted on Drawings.

H. Steel Shapes, Plates and Rods: Conform to ASTM A36 "Specifications for Structural Steel".

I. Do not weld reinforcing steel unless specifically noted on Drawings. If welding is shown, conform to latest revision of AWS D12.1, "Reinforcing Steel Welding Code of the American Welding Society". Perform all welding with certified welders qualified per AWS.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I – Normal, Portland type for all applications other than structures used in conjunction with wastewater projects. All wastewater related structures shall use Type V – Sulfate Resistant, Portland Cement.

B. Fly Ash: ASTM C618, Type C or Type F.
A. Limit use of fly ash to not exceed 20 percent of cement content by weight.

C. Normal Weight Aggregate: ASTM C33 and as herein specified. Provide aggregates from a single source for exposed concrete.
A. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

D. Water: Clean, potable.

E. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.

F. Air-Entraining Admixtures: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

G. Water Reducing Admixtures: ASTM C494, Type A.

H. High Range Water Reducing Admixtures (Super Plasticizer): ASTM C494, Type F or Type G.

I. Water Reducing, Non-Chloride Accelerating Admixture: ASTM C494, Type E.

J. Water Reducing, Retarding Admixture: ASTM C494, Type D.

K. All admixtures shall be supplied by the same manufacturer.

2.4 ACCESSORIES

A. Vapor Retarder: ASTM E1745 Class A; 6 mil thick fabric-reinforced plastic film, 0.03 perms; rated for below grade application. Furnish joint tape recommended by manufacturer.

B. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

C. Concrete Reinforcing Fibers: ASTM C1116, high strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete. Tensile strength 130 ksi; toughness 15 ksi; 3/4 inch long fibers, 34 million/lb fiber count.

D. Waterstops: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as shown on the Drawings.

E. Granular Base: Evenly graded mixture of fine and course aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

F. Sand Cushion: Clean, manufactured or natural sand.

G. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as abrasive aggregate for nonslip finish. Material shall be factory graded, rustproof, non-glazing, and is unaffected by freezing, moisture, and cleaning materials.

H. Colored Wear Resistant Finish: Packaged, dry, combination of materials consisting of Portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides, interground with cement. Color as selected by Engineer.

I. Bonding Compound: Polyvinyl acetate or acrylic base.

J. Epoxy Adhesive: ASTM C881, two-component material suitable on dry or damp surfaces. Provide material type, grade and class to suit project requirements.

2.5 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D994; Asphalt impregnated fiberboard or felt, thickness as indicated on the drawings; tongue and groove profile.

B. Joint Filler Type B: ASTM D1751; cellular bonded fiber material, non-extruding, resiliency recovery of 70 percent if not compressed more than 50 percent of original thickness.

C. Construction Joint Devices: Integral galvanized steel, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

D. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient neoprene filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum of longest manufactured length at each location, flush mounted.

E. Joint Sealant: ASTM C920, Type S; single component, self leveling, premium grade polyurethane sealant, equal to Sikaflex-1C SL.

2.6 CONCRETE MIX

A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.

C. Provide concrete to the following criteria:

Unit	Measurement
Compressive Strength (f'c at 28 day)	4,000 pounds per square inch
Aggregate Size (maximum)	1 inch
Air Entrainment	4 to 6 percent
Slump	3 to 5 inches

D. Prepare design mixes for each type and strength of concrete by either laboratory trial mixture or field experience methods as specified in ACI 318-89 Section 5.3.

E. Mix design based on historical performances in accordance with ACI 318-89 Section 5.3, may be provided by a qualified concrete supplier or precast concrete manufacturer for concrete designs. Mix design shall be certified by an independent testing laboratory.

F. All concrete mix designs shall include the following information:
   A. Proportions of cement, fine and course aggregates and water.
   B. Water/cement ratio, design strength, slump and air content.
   C. Type and source of cement and aggregates.
   D. Type and dosage of all admixtures.
   E. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.

G. Engineer to review and approve mix designs prior to start of concrete production.

H. Design mixes to provide normal weight concrete.

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer.

J. All mix design information and data shall not be older than 18 months from the date of the submittal.

2.7 ADMIXTURES

A. Use water reducing admixture or high range water reducing admixture (superplasticizer) in concrete as required for placement and workability.

B. Use high range water reducing admixture in pumped concrete, concrete required to be watertight, and concrete with water/cement ratio below 0.50.

C. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

D. Use air-entraining admixture in concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete having an air content of 4% to 6% at the point of placement.

E. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.

F. Temperature Limit: Do not place concrete if the concrete temperature exceeds 90ºF or the ambient temperature is 40ºF or less and falling.

G. Slump Limit: Proportion and design mixes to result in concrete slump of 3 to 5 inches at point of placement.

2.8 CONCRETE MIXING

A. Provide batch ticket for each batch used on the project. Batch ticket must indicate project name, contractor's name, date, mix type, mix time, batch time, quantity, and amount of water introduced.

B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as specified.
   A. Addition of water to batch for material with insufficient slump will be permitted in accordance with ACI 301.
   B. When air temperature is between 85 degrees F. and 90 degrees F., reduce mixing and delivery time from 1-1/2 hours to 75 minutes. When air temperature exceeds 90 degrees F. reduce mixing and delivery time to 60 minutes.
   C. Concrete shall only be placed when the air temperature is above 40 degrees F. and rising.

PART 3 EXECUTION

3.1 EXAMINATION

A. Refer to Division 105 – General Conditions

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads.

B. Maintain formwork construction tolerances complying with ACI 301 Table 4.3.1.

C. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, chamfers, blocking, bulkheads, anchorages, and other features required in work.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.

F. Chamfer exposed edges and corners as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

3.3 VAPOR BARRIER

A. General: Following leveling and tamping of granular base for slabs-on-grade, place vapor barrier sheeting with longest dimension parallel with direction of pour.

B. Lap joints 6 inches and seal vapor barrier joints with manufacturer’s recommended mastic and pressure-sensitive tape.

C. After placement of vapor barrier, cover with sand cushion and compact to depth as shown on Drawings.

3.4 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
   A. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

B. Clean reinforcement of loose rust and mill scale, earth ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls, slabs, beams and between walls and footings.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.

F. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

G. Contraction (Control) Joints in Slabs-On-Grade: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8-inch-wide by 1/4 slab depth

or approved inserts, unless otherwise indicated. Make saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregates.

A. With prior approval from Engineer contraction joints may be formed by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

B. Refer to drawings for scoring pattern as shown. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible.

3.6 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with an approved, noresidual, low-VOC, form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in.

B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. Consolidate full depth of placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
   A. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   B. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or derbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations
   C. Maintain reinforcing in proper position during concrete placement.

H. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   A. When placing concrete in cold weather, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   B. Concrete shall only be placed when the air temperature is above 40 degrees F. and rising.
   C. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   D. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

I. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI305 and as herein specified.
   A. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
   B. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
   C. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
   D. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Engineer.

3.8 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched. Fins and other projections exceeding 1/4 inch in height shall be rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaced, which have received smooth form finish treatment, not later than one day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Grout-Cleaned Finish: Provide grout-cleaned finish to scheduled concrete surfaces that have received smooth form finish treatment.

A. Combine one-part Portland dement to 1-1/2 parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to consistency of thick paint. Blend standard Portland cement and white Portland cement, amount determined by trial patches, so that final color of dry grout will match adjacent surfaces.

B. Thoroughly wet concrete surfaces apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

F. Unless otherwise noted on the Drawings, all exposed surfaces shall receive a smooth rubbed finish.

3.9 SLAB FINISHES

A. Refer to Architectural and Structural Specifications for requirements relating to building slabs.

3.10 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.

C. Curing Methods: Perform curing of concrete by curing and sealing compound, b moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

D. Provide moisture curing by following methods.

A. Keep concrete surface continuously wet by covering with water.

B. Use continuous water-fog spray.

C. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

3.11 REMOVAL OF FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed until approved by the structural engineer.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.12 CONCRETE SURFACE REPAIRS

A. General: No surface shall be patched or repaired until the Engineer had reviewed the defective condition and approved the Contractor's submitted repair and/or patching materials and procedures.

B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.
   A. Cut of honeycomb, rock pockets, and voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
   B. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
   1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

D. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein

specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.

A. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 in wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

B. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

C. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.

D. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, when acceptable to Engineer by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method when acceptable to Engineer. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

F. Perform structural repairs with prior approval of Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.13 FIELD QUALITY ASSURANCE, CONTROL AND TESTING DURING CONSTRUCTION

A. General: The Owner will employ CDG Engineers and Associates to perform the required quality assurance testing during construction. The Contractor will notify the Engineer at least 24 hours prior to requiring tests. The Contractor is responsible to provide equipment to allow sampling and testing of the concrete at the point of placement.

B. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94. Perform the following tests.

A. Slump: ASTM C 143; one test at point of placement for each set of compression test specimens; additional tests when concrete properties appear to have changed.

B. Air Content: ASTM C 173 (volumetric method for lightweight or normal weight concrete) or ASTM C 231 (pressure method for normal weight concrete); one test at point of placement for each set of compression test specimens; additional tests when concrete properties appear to have changed.

C. Concrete Temperature: ASTM C 1064; test hourly when air temperature is 40ºF and below or 80ºF and above, and each time a set of compression test specimens is made.

D. Compression Test Specimen: ASTM C 31; one set of 4 cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.

E. Compressive Strength Tests: ASTM C 39; one set for each 50 cubic yards or fraction thereof for each concrete class placed in any one day. One specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing, if required.

F. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

C. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete supplier and testing agency, concrete type and class, location of concrete placed in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but **shall not** be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

F. Quality Assurance consisting of testing and observation of a limited sampling of construction materials will be provided by the Owner for acceptance purposes. Passing test results are not a warranty, guarantee, or certification by the testing agency, Engineer, or Owner that all work was performed in conformance with the plans and specifications. Therefore, the Contractor should not rely solely on test results generated by the quality assurance process as an indication of the suitability of the construction.

G. It is entirely the Contractor's responsibility to perform quality control as necessary to construct the project in conformance with the plans and specifications. Deviations from the plans and specifications, whether identified during construction or following the completion of construction, must be corrected by the Contractor at no cost to the Owner.

3.14 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

SECTION 12361 – PRECAST CONCRETE COUNTERTOPS

PART 1: GENERAL

1.01: Summary

A. Section includes:
   1. Templating, fabrication and installation of precast concrete countertops.

1.02: Submittals

A. Shop Drawings: Indicate profiles of members, jointing, fastening, cut-outs for mechanical services, sinks, accessories, backsplashes, thickness, and related items.

B. Samples: Submit following:
   1. 4 inch by 4 inch samples of concrete with appropriate finish and color for acceptance before proceeding with Work. Indicate maximum range of variation.

1.03: Quality Assurance

A. Regulatory Requirements: Conform to ANSI A117.1 or local code if more stringent requirements are applicable for installing work for accessibility to handicapped.

B. Manufacturer Qualifications: Company specializing in fabricating work specified in this Section with minimum four years experience in type work required for Project.

C. Concrete fully engineered to comply with appropriate ACI 318 guidelines.

1.04: Delivery, Storage and Handling

A. If units are shipped via commercial freight, open crates and inspect each slab in the presence of the driver. Note any and all damage, and do not accept shipment if damage is present. Claims due to shipping damage must be submitted to the freight carrier.

B. Handle, transport and store units to prevent damage to materials or structure. Handle with care to prevent damage to corners and edges.

1.05: Site Conditions

A. Templating
   1. All cabinets, millwork or other supporting structures must be fully installed prior to templating, unless otherwise arranged with manufacturer.
   2. All cabinets, millwork or other supporting structures must be free of debris or obstructions.
   3. All fixtures that penetrate the concrete, such as sinks, faucets, drop-in cook tops, soap dispensers, etc., must be on site at the time of templating.
   4. Electricity must be available on site, with outlets or extension cords, and running water must be available in proximity of area to be templated.

B. Installation
   1. Installer's vehicle must be able to park within 10 yards of installation area's key point of entry.
   2. Pathway to installation area must be free of debris or obstructions and accessible to two to three personnel carrying slabs weighing up to 350 pounds and up to eight feet in length.
   3. All cabinets, millwork or other supporting structures must be free of debris or

obstructions.
4. Electricity must be available on site, with outlets or extension cords within 25 yards of installation area.
5. Running water must be available on site within 100 yards of the installation area.

1.06: Sequencing

A. Templating
   1. All cabinets, millwork or other supporting structures must be fully installed prior to templating, unless otherwise arranged with manufacturer.
   2. All fixtures that penetrate the concrete, such as sinks, faucets, drop-in cook tops, soap dispensers, etc., must be on site at the time of templating. Manufacturer does not supply fixtures. Manufacturer may take custody of some or all of the fixtures at his discretion.
B. Installation
   1. All support brackets, hard point connections, etc., must be on site at the time of installation. Manufacturer does not supply these items.
   2. Electrical and plumbing hookup should be scheduled after installation is completed. Manufacturer does not perform electrical and plumbing hookup.

1.07: Warranty

A. Manufacturer must offer at least a one-year structural warranty as follows: During the first year after installation, manufacturer, at its sole option, shall repair or replace product if it fails to maintain functional structural integrity for the intended purpose of the product solely due to a manufacturing defect. This applies only to products that have been handled, fabricated, installed and maintained in the manner recommended by the manufacturer. Hairline cracks, surface scratches and chips are not included as part of this warranty, nor is structural damage caused by severe impacts, physical overloading or damage stemming from loss of support and/or excessive deflections by the supporting cabinetry or hardware. Individual slabs are designed to safely support a maximum 300 lb. point load centered on the slab.

B. Manufacturer must offer at least a one-year coating/sealer warranty as follows: During the first year after installation, manufacturer, at its sole option, shall repair or replace sealer if it fails to maintain functional integrity for the intended purpose of the product solely due to a manufacturing defect. General food preparation will not stain the concrete as long as spills are wiped up promptly. This warranty does not cover damage to the sealer resulting from impacts, cuts, scrapes or damage by harsh chemicals or intense heat. Prolonged exposure to acids and acidic food items may cause etching. Spills should be removed as soon as possible; however, the resistance to oils, alcohol and normal food items is very good. The sealer used is resistant to hot objects up to 450 degrees Fahrenheit. Above this temperature, the sealer may become damaged. Repeated placement of objects over 450 degrees Fahrenheit should be avoided. Cutting directly on the countertop or exposure to open flame voids the warranty.

1.08: Maintenance

A. Variations in texture, dimension, color and aggregate distribution and exposure within a final product are an inherent property of concrete countertops. Hairline cracks that may occur in the finished product are a natural characteristic of concrete. Minor non-structural hairline cracks or crazing may result from shrinkage or substrate movement and shall not be considered a manufacturing defect. All units are sealed to resist moisture and staining. As with natural materials, samples of any material may not accurately represent installed material. All sizes are nominal and slight variations in thickness are to be expected.

B. Use common normal care with respect to oil, acids, and food. Spills should be wiped up as soon as possible. Clean using damp cloth or sponge and only with mild, non-surfactant neutral-pH cleaners. Manufacturer recommends StoneTech's Revitalizer cleanser. Do not use harsh cleansers or chemicals, or abrasive cleansersor scrubbers. These include Comet, Brillo pads and 3M scrubbing pads, and all similar products.

C. Staining can occur if staining agents are left on for more than a few minutes. Exposure to acids and acidic food items may cause etching.

D. With normal use and care, the factory-applied sealer should provide 3 to 5 years of protection before requiring reapplication. Reapplication is a simple process that can be performed on site by maintenance personnel. Thesealer used is highly heat resistant, but discoloration and physical damage may occur with very hot items (greater than 450 degrees F) or open flame. Discoloration or damage may occur to any wax applied to the countertops. Wax shall not be applied to countertops sealed as specified.

PART 2: PRODUCTS

2.01: Manufacturers

A. With approval

2.02: Material

A. Precast Concrete Countertop
   1. All units to be structurally engineered and custom made using a precast, custom-blended, structurallyreinforced Portland cement based concrete.
   2. Density: approx. 140 lbs. per cubic foot. Weight per unit area: 14lbs/sq. ft. for 1.75" thick slabs.
   3. Standard Thickness: 1.75" nominal. Options: Custom thickness and front edge returns. Minimumthickness for horizontal slabs is 1.5".
   4. Standard Edge: Square edge, eased radius and corners.
   5. Color: Various shades, hues and tones using integral pigment. Options: Custom colors and premiumcolors with embedded glass, stones or other items.
   6. Standard Maximum Seamless Casting: approximately 8 ft. L for standard depth countertops (25"). Options: Custom sizes and shapes as specified in shop drawings.
   7. Backsplashes: Length matched to slab section. Max 96" L x specified height. Height, length andthickness will affect maximum length. Backsplashes are cast separate from the countertops.
   8. Sealer: All units to be factory sealed with a high performance topical sealer. This sealer must exhibitthe following properties:
      a. Safe for food contact surfaces.
      b. Colorless.
      c. Suitable for interior use
      d. Water repellent
      e. Non-yellowing (UV resistant).
      f. Scratch resistant.
      g. Peel, chip and flake resistant
      h. Highly heat resistant.
      i. Stain resistant to food and oil when wiped up immediately.
      j. Long lasting.
      k. Environmentally safe.
      l. Simple and quick reapplication only when necessary.
   9. Cracks: Non-structural hairline cracks are possible and may result from shrinkage or substratemovement over time. These are not covered under standard warranty.

B. Joint Sealant
   1. Supplied by manufacturer.

2. Colors: Matched to countertop or 100% clear silicone unless otherwise requested.
3. Acceptable products:
    a. Accucolor TA-850 sanded, siliconized acrylic caulk by TEC Specialty Products, Inc.,Palatine, IL., or equivalent

C. Adhesive
1. Supplied by installer.
2. Countertop: Clear 100% silicone caulk.
    a. GE Silicone I Kitchen & Bath or equivalent.
3. Backsplashes: Clear 100% silicone caulk.
    a. GE Silicone I Kitchen & Bath or equivalent.
4. Other vertical applications: Thin set mortar.
    a. Laticrete 253 Multipurpose Thin-Set mortar, or equivalent.

2.03: Fabrication

A. All units to be custom made in manufacturer's manufacturing shop. Options: Delivery and installation; availability varies by location.

B. All units to be structurally reinforced to accommodate appropriate spans, cutouts and cantilevers. Slabs must behandled and moved while in a vertical orientation, similar to the technique used for handling plate glass.

C. All units to be fabricated straight, smooth, and true to size and shape prior to finishing. Exposed edges to befinished as per edge specifications. Maximum dimensional variations: +0", - 1/4" at maximum slab length; typical variations are usually half of the maximum or less.

D. All units to be fabricated to accommodate specified appliances (i.e. sinks, cook tops, faucets, etc.). No cuttingis done in the field.

E. All units to be hand finished prior to sealing. Hand finishing includes first grinding the surface, then filling voidsand honeycomb with colored grout, easing all edges (where appropriate), and leveling and polishing.

E. Units to be air dried and sealed.

F. Countertops will not be ready for delivery or installation until steps A through F have been completed to manufacturer's satisfaction.

2.04: Finishes

A. All units to be factory sealed with sealer that meets requirements in Article 2.02 (A) 8.

PART 3: EXECUTION

3.01: Templating

A. Manufacturer performs templating, or, manufacturer provides detailed templating instructions to contractor, andcontractor provides templates to manufacturer.

Article 3.02: Installation

A. Manufacturer performs installation, or, manufacturer provides detailed installation instructions to contractor, andcontractor performs installation.

3.03: Cleaning

A. General:
    1. Keep installed work clean as work progresses.
    2. Wipe up spills as soon as possible. Clean using damp cloth or sponge and mild, non-surfactant, neutral pH detergent or other water-based cleansers. Do not use harsh chemicals, abrasive cleansers or abrasive scrubbers. Manufacturer recommends StoneTech's Revitalizer cleanser.

SECTION 01330 - SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

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

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

1.03 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   (1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
   (2) Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Schedule: Prepare a fully developed, CPM-type Contractor's construction schedule. Submit within 30 days of the date established in the "Notice to Proceed" for commencement of the Work.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner's Representative, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

   (1) When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.05 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect and Owner's Representative upon request:

List of subcontractors at the site.
Approximate count of personnel at the site.
High and low temperatures; General weather conditions.
Accidents and unusual events.
Meetings and significant decisions.
Stoppages, delays, shortages, losses.
Meter readings and similar recordings.
Emergency procedures.
Orders and requests of governing authorities.
Change Orders received, implemented.
Services connected, disconnected.
Equipment or system tests and start-ups.
Partial Completion, occupancies.
Substantial Completions authorized.

1.06 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

Dimensions.
Identification of products and materials included.
Compliance with specified standards.
Notation of coordination requirements.
Notation of dimensions established by field measurement.

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

1.07 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data including printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawings.

B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
(1) Do not permit use of unmarked copies of Product Data in connection with construction.

1.08 SAMPLES

A. Submit fully-fabricated samples (full-size where appropriate) cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

B. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

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

D. Field Samples or Mock-Ups specified in individual Sections are special types of samples. Field Samples or Mock-Ups are full-size examples erected on site to illustrate finishes, construction, assembly, materials, coatings, etc., and to establish the standard by which the Work will be judged.

1.09 ARCHITECT'S ACTION

A. Action Stamp: The Architect will stamp each copy of each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

B. Do not permit submittals marked Revise and Resubmit to be used at the Project Site or elsewhere where Work is in progress.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01330

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

(1) Obtain and pay for all building permits, fees and licenses required by authorities having jurisdiction.

B. Temporary utilities required include, but are not limited to:

(1) Temporary electric power and light.
(2) Telephone service.

C. Temporary construction and support facilities include, but are not limited to:

(1) Temporary heat.
(2) Field offices and storage sheds.
(3) Temporary roads and paving.
(4) Sanitary facilities, including drinking water.
(5) De-watering facilities and drains.
(6) Temporary enclosures.
(7) Hoists.
(8) Temporary project identification signs and bulletin boards.
(9) Waste disposal services.
(10) Rodent and pest control.
(11) Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to:

(1) Temporary fire protection.
(2) Barricades, warning signs, and lights.
(3) Enclosure fence for the site.
(4) Environmental protection.

1.03 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

(1) Building Code requirements
(2) Health and safety regulations
(3) Utility company regulations
(4) Police, Fire Department and Rescue Squad rules
(5) Environmental protection regulations

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series Standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

(1) Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

(2) Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.01 MATERIALS

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

B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough and Finish Carpentry".

(1) For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.

C. Tarpaulins: Provide waterproofing, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

D. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chainlink fabric fencing 6-feet high, with galvanized steel pipe posts; 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts. This applies only on projects in which th

2.02 EQUIPMENT

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

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units with lockable entrances, operable windows and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. First Aid Supplies: Comply with governing regulations.

J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposure.

(1) Comply with NFPA 10 and 241 for classification, extinguishing, agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

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

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

(1) Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
(2) Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
(3) Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
(4) Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

(1) Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

(1) Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20

ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

(1) Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station.

(1) At each telephone, post a list of important telephone numbers for persons having interest in this project, and for emergency services.

F. Sewer and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

(1) Maintain temporary construction and support facilities until near substantial completion. Remove prior to substantial completion. Personnel remaining after substantial completion will be permitted to use permanent facilities under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds, located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of complete installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fueled oil heaters with individual space thermostatic control.

(1) Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Field Offices: Provide insulated, weather tight temporary offices of sufficient size to accommodate required office personnel at the project site. Keep the offices clean and orderly for use for small progress meetings. Furnish and equip offices as appropriate to conduct business.

F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.

(1) Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

G. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

(1) Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
(2) Install tarpaulins securely, with combustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
(3) Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

H. Collection and disposal of waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (28 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

I. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division -2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

J. Project Identification and Temporary Signs: Prepare project identification and other signs. Install signs where directed to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

(1) Project Identification Sign: Engage an experienced signage manufacturer to prepare project identification sign (nominal sign size: 4'x 8'). See General Conditions for Project Sign layout.

(2) Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as required by the Architect.

B. Temporary Fire Protection: Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

(1) Locate fire extinguishers where convenient and effective for their intended purpose.
(2) Store combustible materials in containers in fire-safe locations.
(3) Maintain unobstructed access to fire extinguishers, and access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
(4) Provide supervision of welding operations, combustion type temporary heating units and similar sources of fire ignition.

C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

D. Enclosure Fence: When construction begins install an enclosure fence that will enclose a portion of the site sufficient to safely accommodate construction operations.

(1) Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth. Upon completion, remove fencing.

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrance to prevent unauthorized entrance, vandalism, theft and similar violations of security.

(1) Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

(1) Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
(2) Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or not later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

(1) Materials and facilities that constitute temporary facilities are property of the Contractor.

END OF SECTION 01500

CONTRACT CLOSEOUT- SECTION 01770

1.0 - GENERAL

A. Closeout requirements for specific construction activities are included in the appropriate Sections in Division 2 through 16.

8. Final Inspection Procedures: See Section 01030 - Special Project Requirements for Inspection Requirements
   1. Deliver tools, spare parts, extra stock, and similar items.
   2. Changeover locks and transmit keys to the Owner.
   3. Complete startup testing of systems and instruction of operation and maintenance personnel. **Obtain signature(s) of all Owner's personnel participating in operation and maintenance instructions.**
   4. Remove temporary facilities, mockups, construction tools, and similar elements.
   5. Complete final cleanup requirements, including touchup painting.
   6. Touch up and repair and restore marred, exposed finishes.

C. After Substantial Completion has been achieved, the General Contractor shall:
   1. Submit final payment request with releases and supporting documentation. Include insurance certificates where required.
      a. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
      b. Advise the Owner of pending insurance changeover requirements.
      c. Submit specific warranties, workmanship bonds; maintenance agreements, final certifications, and similar documents.
      d. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
      e. Deliver tools, spare parts, extra stock, and similar items.
      f. Changeover locks and transmit keys to the Owner.
      g. Complete startup testing of systems and instruction of operation and maintenance personnel. Obtain signature(s) of all Owner's personnel participating in operation and maintenance instructions.
   2. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
   3. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.
   4. Submit Consent of Surety to final payment.
   5. Submit Release of Liens.
   6. Submit a final settlement statement.
   7. Submit evidence of continuing insurance coverage complying with insurance requirements.

D. Record Drawings: Maintain a set of prints of Contract Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.
   1. Mark sets with red pencil.
   2. Mark completed record drawings: "As-Built" Set.
   3. Upon completion of the Work, submit record drawings to the Architect for the Owner's records in the form of two (2) CD's.

E. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data. Mark cover of set: "As-Built".

Upon completion of the Work, submit record Specifications to the Architect for the Owner's records in the form of two (2) CD's.

Note: If space allows, both "As-Built" plans and specs may be scanned and saved onto a single CD and 2 copies of record CD's shall be submitted.

F. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 3-ring binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.

G. The Architect's office has compiled a set of Shop Drawings throughout the project for the Owner's records. Architect shall submit one copy of Shop Drawings to the Owner with close-out documentation.

H. Close-Out Documents

Close-Out Documents consists of the following:

1. General Contractor's Warranty
2. Subcontractors' Warranties
3. Manufacturers' Warranties
4. Affidavit of Advertisement of Completion
5. Consent of Surety to Final Payment
6. Contractor's Affidavit of Release of Liens
7. Operating and Maintenance Manuals/ Instructions to Owner
8. "As-Built" Plans and Specification Manual
9. Owner's Set of Shop Drawing Submittals

General Contractor shall submit three (3) sets of binders for Items 1-7. Documents should be bound in 3-ring binders in size suitable for amount of material included. Divider tabs should be used to separate items.

If Operating Manuals are large, they can be bound in separate binders as indicated under Paragraph I listed above.

"As-Built" Plans and Specification Manual (2 set of each) should be complete and submitted on CD's. All plans should be submitted as one set. Do not submit separate sets of "As-Built" plans for Plumbing, HVAC, Electrical, etc.

Shop Drawings do not need to be submitted to the Architect. As indicted under Paragraph J listed above, the office of the architect has maintained one set of shop drawings throughout the course of the project for close-out documentation to the Owner.

2.0 - PRODUCTS (Not Applicable)

3.0 - EXECUTION

A. Operation and Maintenance Instructions:
Arrange for each Installer of equipment that requires maintenance to provide instruction in proper operation and maintenance. Include a detailed review of the following items.
1. Maintenance manuals.
2. Spare parts, tools, and materials.
3. Lubricants and fuels.
4. Identification systems.
5. Control sequences.
6. Hazards.
7. Warranties and bonds.
8. Maintenance agreements and similar.

B. As part of instruction for operating equipment, demonstrate the following:
1. Startup and shutdown.
2. Emergency operations and safety procedures.
3. Noise and vibration adjustments.

C. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.
1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and foreign deposits. Rake grounds to a smooth, even textured surface.

D. Pest Control: Engage a licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

E. Removal of Protection: Remove temporary protection and facilities.

F. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

END OF SECTION

WARRANTIES - SECTION 01900

1.0 - GENERAL

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
   1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

C. Warranties
   1. Subcontractors: General Contractor shall provide a one-year warranty from each Subcontractor they have under contract for the project.

   2. Vendors/Suppliers: General Contractor shall obtain a one-year warranty from each Vendor/Supplier for manufactured product used for the project. Example: *XYS Building Products, Inc.* shall provide a one-year warranty for each product they provided for the project, such as, *toilet partitions and hollow metal doors and frames.* This warranty may be on a form or letterhead provided by the Vendor/Supplier and must list all products provided for the project.

   3. Manufacturers: The Manufacturer's warranty for each product shall be placed directly behind the applicable Subcontractor or Vendor/Supplier's warranty within the warranty binder.

   4. Roof Warranties: The executed roofing warranties shall be presented at Final Inspection. Manufacturer's warranties cannot be prorated.

D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's and limitations on product warranties do not relieve suppliers, manufacturer's and subcontractors required to countersign special warranties with the Contractor.

E. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

F. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

G. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

H. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise

available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

I. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

J. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

K. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper. Three (3) sets of warranties and close out documents are required: one set will be retained by the Architect and two sets will be delivered to the Owner.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.

2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.

3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

2.0 - PRODUCTS (Not Applicable)

3.0 - EXECUTION

The One-Year Warranty issued by the General Contractor shall list all disciplines they are covering when there is not a warranty from a Subcontractor. For instance, some General Contractors have Masons employed within their company and, therefore, do not contract Masonry work through a Masonry Subcontractor. In that case, the General Contractor's warranty would list Masonry as part of their itemized list of warranted work. Other typical examples are Painting, Rough Carpentry,

Miscellaneous Metals, etc.

Warranties shall bear the same date as the Date of Substantial Completion. All warranties shall be effective for a period of One Year from Date of Substantial Completion with exceptions for special warranties requiring extended periods of warranty coverage.

This list is designed as an aid to comply with close-out procedures; however, it should not be considered a complete and comprehensive list. General Contractor should review warranty requirements specified in Project Manual.

Warranties shall include, but not be limited, to the following:

Warranties from ALL Subcontractors for this project.

DIVISION 5 -METALS
Miscellaneous Metals
Roof Edge Protection

DIVISION 6 - CARPENTRY
Carpentry

DIVISION 7 - MOISTURE PROTECTION
Asphalt Shingles
TPO Roofing System

NOTE: Provide roofing warranties as stipulated in Division 7 of the specifications, and as required by The State of Alabama Department of Construction Management. Roofing warranties shall be presented at the time of Final Inspection.

DIVISION 10 - SPECIALTIES
Roof Identification Plaque

See attached WARRANTY FORMS immediately following for General Contractors and Subcontractors.

GENERAL CONTRACTOR WARRANTY FORM

G.C.'S PROJECT NO._____ **ARCHITECT'S PROJECT NO:**_____

PROJECT NAME:_____

GENERAL CONTRACTOR: _____

(Name and Address) _____

_____

PROJECT OWNER: _____

ARCHITECT: B. Craig Lipscomb, Architect, 442 Chestnut Street, Gadsden, AL 35901

PROJECT SUBSTANTIAL COMPLETION DATE:

This is to certify that we,---------- the General Contractor for the above referenced project, per contract documents, warrant all labor, material and equipment provided and performed for a period of One (1) Year from the Date of Substantial Completion indicated above.

If applicable, we warrant additional work, materials and equipment for One (1) Year on the following:

_____

_____

_____

_____

By: _____
(Name and Title)

Dated this_____ **day of** _____

State of Alabama
County of_____

Sworn to and subscribed before me this

_____ day of _____

_____
Notary Public

My Commission Expires:_____

SUBCONTRACTOR WARRANTY FORM

G.C.'S PROJECT NO._____ **ARCHITECT'S PROJECT NO:**_____

PROJECT NAME: _____

GENERAL CONTRACTOR: _____

SUBCONTRACTOR: _____

(Name and Address) _____

_____

PROJECT OWNER: _____

ARCHITECT: B. Craig Lipscomb, Architect, 442 Chestnut Street, Gadsden, AL 35901

PROJECT SUBSTANTIAL COMPLETION DATE:

We (name) Subcontractor for (work)
as described in Specification Section(s) ---------- do hereby warrant that all labor and materials provided and performed in conjunction with·above referenced project are in accordance with the Contract Documents and will be free from defects due to defective materials and/or workmanship for a period of One (1) year from the Date of Substantial Completion indicated above or as required by the Specification Section relevant to your trade.

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

The Owner will give Subcontractor written notice of defective work. Should Subcontractor fail to correct defective work within Thirty (30) days after receiving notice. the Owner may. at his option. correct defects and charge Subcontractor cost for such correction. Subcontractor agrees to pay such charges upon demand.

Warranty applies to the following Work: _____

_____

_____
(Name and Title)

Dated this_____day of

SECTION 02830 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:
1. Fence framework, fabric, and accessories.
2. Excavation for posts.
3. Concrete encasement for posts.
4. Manual gates and related hardware.

C. Related Sections:
1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."

1.2 REFERENCES

A. General:
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
Federal Specifications (FS)

B. FS RR-F-191/1C Fencing, Wire and Post Metal (Chain-Link Fence Fabric)

C. American Society for Testing and Materials (ASTM)
1. ASTM A123 / A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM C94 / C94M Standard Specification for Ready-Mixed Concrete
3. ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
4. ASTM D 792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
5. ASTM D 1499 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics
6. ASTM D 2240 Test Method for Rubber Property—Durometer Hardness
7. ASTM F 668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Submit shop drawings and product data.
   1. Include accessories, fittings, hardware, anchorages, and schedule of components.

C. Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Fencing: Materials for vinyl-coated chain link fence shall be as specified herein. Material shall be of the same color of vinyl coating. Painted finishes are not acceptable.

B. Posts and Braces: Section 80-4.01A of CALTRANS

C. Fabric: Section 80-4.01B of CALTRANS

D. Accessories: Section 80-4.01C of CALTRANS

E. Gates: Section 80-4.01D of CALTRANS

2.2 CONCRETE MIX

A. Concrete: ASTM C 94; type II Portland Cement; 2500 psi at 28 days; 3-inch (75 mm) slump; 3/4-inch (20 mm) maximum size aggregate.

2.3 COMPONENTS

A. Line Posts: 2.375-inch (59 mm) outside diameter, Schedule 40 galvanized steel pipe or galvanized "H" columns weighing not less than 2.7 lb./ft (13.18 kg/m²).

B. Corner and Terminal Posts: 2.875-inch (73 mm) outside diameter, Schedule 40 galvanized steel pipe.

C. Gate Posts: 3.500-inch (89 mm) diameter for man gates and 6.625-inch (168 mm) diameter for vehicular gates; gateposts to be galvanized steel pipe.

D. Top, Bottom and Brace Rail: 1.660-inch (42.16 mm) outside diameter, plain end, sleeve coupled galvanized steel pipe.

E. Gate Frame: 1.9-inch (48.26 mm) outside diameter Schedule 40 galvanized steel pipe for fittings and truss rod fabrication.

F. Fabric/Vinyl Coated Steel: Chain link fence fabric shall be galvanized steel wire with a continuously bonded vinyl coating, with a finish size (i.e., size after coating) of 8 gauge, and shall comply with ASTM F 668. Fabric height shall be 6 feet (2.44 m) , +/- 3/4 inch (20 mm), with knuckled, selvage edges on the bottom and top. Mesh shall be vertically-woven diamond mesh, with a nominal distance of 2 inches (50 mm) between parallel wires.

G. Tension Bars: 3/16 inches by 3/4-inch (4.76 mm by 20 mm) galvanized steel flat bars.

H. Caps: Cast steel or malleable iron, galvanized, sized to post dimension, set-screw retained.

I. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings shall be galvanized steel.

J. Gate Hardware: Fork type latch with gravity drop; center gate stop and drop rod; three 180 degree gate hinges per leaf.

2.4 FINISHES

A. Galvanized Surfaces: Galvanize surfaces in accordance with ASTM A 123, with a coating of at least 1.20 oz/sq. ft.

2.5 VINYL COATING

A. The vinyl coating shall conform to FS RR-F-191/1C.

B. Colors shall be stabilized, and shall have a light fastness to withstand a minimum Weather-O-Meter exposure of at least 1500 hours without deterioration when tested in accordance with ASTM D 1499.

C. Specific gravity shall be between 1.26 and 1.30 in accordance with ASTM D 792.

D. Hardness shall be A90 +/-5 in accordance with ASTM D 2240.

E. Tensile strength shall be between 2600 and 3000 psi (17.94 MPa and 20.7 MPa) in accordance with ASTM D 412.

F. Vinyl coating shall be exposure-resistant to dilute solutions of most common mineral acids, sea water, salts, and alkali.

G. Vinyl coating shall be continuously bonded to the wire under 5000 psi (34.5 MPa) pressure before the wire is woven into fabric.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install security fence of 6-foot (2.45 m)

B. Space line posts at intervals not exceeding 10 feet (3 m).

C. Set gate and posts plumb, in concrete footings with top of footing 1 inch (25 mm) above finish grade. Slope top of concrete for water runoff. Footings for line end and corner posts are to be 8 inches (203) diameter by 3 feet (0.09 m) deep below finish grade and for gates are to be 12 inches (305 mm) diameter by 3 feet 6 inches (1 m) deep below finish grade.

D. Provide top rail through line-post tops and splice with 7-inch (178 mm) long rail sleeves.

E. Brace each gate and corner post back to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

F. Install center and bottom brace rail on corner and gate leaves.

G. Stretch fabric between terminal posts or at intervals of 100 feet (30,5 m) maximum, whichever is less.

H. Position bottom of fabric to no more than 2 inches (50 mm) above concrete or asphalt grade and touching dirt finish grade.

I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with 11-AWG galvanized wire ties 24 inches (610 mm) maximum on centers.

J. Attach fabric to end, corner, and gateposts with tension bars and tension bar clips.

K. Install bottom rail supported at each line and terminal post in such a manner that a continuous brace between posts is formed.

L. Install gates with fabric match fence. Install three hinges per leaf, latch, catches, drop bolt, foot bolts and sockets.

3.2 GROUNDING

A. 40 feet (13 m) on either side of overhead high voltage electrical transmission lines the fence is to be grounded as shown on the Drawings.

END OF SECTION 02830

SECTION 02938
NON-ATHLETIC
GRASS SODDING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Preparation and Placing of subsoil.
B. Fertilizing.
C. Sod installation.
D. Maintenance.

1.2 SCOPE

A. The work consists of performing all grass sodding and related work as indicated on drawings and described in this section.
B. Unless otherwise indicated, the Contractor is responsible for the repair of any existing lawn areas disturbed during the construction process
C. The Contractor is responsible for the irrigation of all lawn areas on the project, including those not covered by an irrigation system.
D. The Contractor is responsible for the all maintenance to the Bermuda grass lawns during a minimum 2-month grow in period.

1.3 BERMUDA GRASS FIELD INSTALLER QUALIFICATIONS

A. A contractor specializing in all grading and grassing. The contractor shall submit a list of projects successfully completed during the past three years, including a list of three similar Bermuda Grass projects for the approval of the Architect and the Owner. Include information concerning the project Owner and references with telephone contact numbers.

1.4 REFERENCES AND RELATED DOCUMENTS

A. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.
B. FS O-F-241 - Fertilizers, Mixed, Commercial.
C. Section 02200, Earthwork.
D. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under, Division 1, General Requirements, are included as part of this section.

1.5 DEFINITIONS

A. Weeds: Include Crab Grass, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedges, Bindweed, Goose Grass, Crowfoot Grass, Torpedo Grass, Spurges, Spreading Dayflower, Guinea Grass, Bull Paspalum, Sandbur, Love Grass, Finger Grass, Paricum Grasses, Foxtail, Smut Grass, Amaranth, Chickweeds, Ragwood, Spanish Needles, Thistle, Horseweed, Dogfennel, Cudweed, Hawksbeard, Dollarweed, Pepperweed, Beggarweeds, Sida, Oxalis, Pusley, Penneywort, Matchweed, and Punctureweed.

1.6 SUBMITTALS

A. Provide submittals per section 01300.

B. Provide submittals for the following products for the Architects approval of prior to start of work on the sodding.
    1. Fertilizer
    2. General soil analyses
    3. Herbicides
    4. Fire ant certification from the sod supplier
C. Section 01700 - Contract Closeout: Procedures for submittals.
D. Operation Data: Submit for continuing Owner maintenance.
E. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height, types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

A. Sod: 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. Submit sod certification for grass species and location of sod source.
C. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Florida.
D. Installer: 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.
C. Contractor shall follow all regulations, ordinance, and code governing the work, including but not limited to permitting and inspections.

1.9 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect products.
B. Deliver sod on pallets. Protect exposed roots from dehydration.
C. All sod delivered to the site, shall be laid within 8 hours.

1.10 PROJECT CONDITIONS

A. Contractor shall inspect the site and plans to become aware of the project conditions and requirements before submitting a bid.
B. Section 01040 - Coordination and Meetings.
C. Sequence installation to ensure orderly and expeditious utility connections.
D. Coordinate with installation of underground sprinkler system pipe and watering heads.

1.11 CONTRACTOR SUPERVISION

A. The Contractor shall provide a competent superintendent and any necessary assistants on the project when work is in progress.
B. Do not change the superintendent during the project without the consent of the Architect unless the superintendent leaves the Contractor's employment.
C. The superintendent shall represent the Contractor and in the Contractor's absence all directions given to him by the Architect shall be binding as if given to the Contractor.
D. The Contractor's superintendent shall supervise the Contractor's employees on the job site and be responsible for their actions and conduct on the job site.

1.12 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect the Owner's property from injury or loss arising in connection with his work.
B. The Contractor is responsible for contacting the necessary entities to determine the locations of all underground utilities on the site.
C. The Contractor shall take care to avoid damage to any existing buildings, equipment, piping, pipe coverings, electrical systems, sewers, sidewalks, landscaping, grounds, aboveground or underground installations or structures of any kind, and shall be responsible for any damage that occurs as a result of his work.
D. Contractor shall adequately protect his work and all adjacent property as provided and required by law.
E. Utilities noted on the plans are anticipated locations only. The utilities shown may not include all underground utilities on the site, and the locations indicated may not be as installed.

PART 2 PRODUCTS

2.1 GRASS SOD

A. Sod shall be the recognized Tifway 419 Bermuda.
B. Tifway 419 Bermuda sod shall have well matted with roots; shall have firm tough texture having a compact top growth and heavy root development. Bermuda sod shall be sand based, and contain no weed of any type. The soil embedded in the sod shall be free from fungus, vermin and other diseases and shall have been mowed no more than 4 days before the sod is cut. The sod shall be taken up in rolls sized 42" wide and 75' long. Remove all netting from the back of the sod prior to installation. The soil base of the sod shall be of a uniform thickness.
C. Sod shall be sufficiently thick to insure a dense stand of live grass. Sod shall be live, fresh, and uninjured at the time of planting. Plant sod within 48 hours after harvesting.
D. Use only sod certified free of fire ants. Before delivering any sod to the project, the Contractor shall furnish to the Owner and the Architect written certification from the supplier that the sod is free of fire ants.

2.2 COMMERCIAL FERTILIZERS

A. Commercial fertilizer shall comply with the State Fertilizer Laws. Numerical designation for fertilizer indicates the minimum percentage respectively of (1) total nitrogen, (2) available phosphoric acid, and (3) water soluble potash contained in the fertilizer.
B. Fertilizer for Bermuda grass shall be 15-5-15 with the rate and minor nutrients as recommended by the agricultural laboratory performing the tests on the project topsoil.

2.3 WATER

A. Contractor shall supply and apply all water.

2.4 ROLLER

A. Contractor shall use a roller(s) appropriately sized to achieve the required lawn surface grade.

2.5 FERTILIZER SPREADER

A. Contractor shall use a device for spreading the fertilizer capable of uniformly distributing the material at required rates.

2.6 HERBICIDES

A. The Contractor shall select, provide, and apply all herbicides as required.

2.7 TOPSOIL

A. Topsoil for Bermuda Tifway 419 Lawns: If required, additional topsoil shall be as required by the recommendations of the agricultural laboratory performing the analysis of the project soil.

2.8 SOIL FUMIGANTS

A. The Contractor shall select and provide soil fumigants as required to eradicate all soil organisms, all existing vegetation, and all plant seeds and other forms of plant regeneration.
B. Use all soil fumigants and other materials as specified and recommended by the manufacturer(s). All soil fumigants shall be suitable for their intended purpose.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Contractor and his Bermuda grass installer shall coordinate and attend a pre-work meeting
B. Verify that prepared soil base is ready to receive the work of this section.

3.2 GENERAL: The order of work for sod installation shall be as follows:
A. Bermuda Grass Lawns:
1. Roto-tilling of all compacted areas.
2. Laser subgrading.
3. Installation of topsoil and other soil amendments.
4. Roto-tilling of topsoils and amendments into the existing soils.
5. Removal of debris as required.
6. Soil fumigation.
7. Final laser grading in accordance with specific elevations noted in the civil engineering grading plans.
8. Placement of sod.
9. Clean up.
10. Watering.
11. Beginning of required grow-in period and maintenance.
12. Application of fertilizer four and eight weeks after installation.
13. Rolling of sod approximately four weeks after installation.

3.3 ROTO-TILLING:

A. Roto-till all lawn areas that have become compacted during the construction process as required to assure adequate percolation of water through the soil.

3.4 SUBGRADE:

A. Prepare subgrade for all areas receiving sod, as required to produce the finish grades indicated on the grading plans and specifications.
B. Remove all existing shell rock or other road base that encroaches more than 12" into any lawn area, and fill any voids cause by road base removal with clean, well-draining, and properly compacted planting soil

3.5 INSTALLATION OF TOPSOIL AND SOIL AMENDMENTS

A. Install additional topsoil and other soil amendments in Bermuda grass areas as required to accommodate the required grades and the recommendations of the testing laboratory. Roto-till all materials into the existing soil until the top 6" of soil is a homogeneous mixture.

3.6 REMOVAL OF DEBRIS

A. Clean areas receiving grass of all stones larger than ¼ inch in diameter, sticks, stumps, paper, glass and other debris. Kill by herbicide and remove all weeds or existing grasses from areas to receive sod.

3.7 FUMIGATION OF THE BERMUDA GRASS LAWN AREAS

A. The Contractor shall fumigate the lawn areas receiving Bermuda grass to eradicate all soil organisms, all existing vegetation is, and all plant seeds and other forms of plant regeneration. The Contractor shall use a soil fumigation method that guarantees all vegetative matter and soil organisms in the soil are eradicated. Use all soil fumigants and other materials as specified and recommended by the manufacturer(s).

3.8 FINE GRADING

A. After removal of debris, perform fine grading as required to bring all areas to receive grass to a smooth, even, and finished grade. Use a laser grader to fine grade areas receiving Bermuda grass. Fine grade other areas receiving grass by raking to eliminate wind rows, ridges, depressions and other irregularities. The Contractor shall fine grade areas receiving sod as necessary to achieve a finished grade (top of the sod) as specified in this section.
B. All sodded areas bordered by sidewalks, asphalt pavement, or curbs shall have a finished grade (top of the sod's soil) that is flush (or less than ½" below) with the grade of the adjacent sidewalk, asphalt pavement, or curb.
C. All sodded areas bordered by planting areas shall have a finished grade (top of the sod's soil) that is 1½" above the soil level in the adjacent planting bed.

3.9 PLACING OF SOD

A. The setting of pieces shall be staggered in such a manner as to avoid continuous seams. Sod shall be moist and placed on a moist earth bed. Carefully place sod by hand, edge to edge in rows at right angles to the slope, starting at the base of the area and working upward. There shall be no voids between sod pieces, no overlapping of the edges of sod pieces, and the finished grade of all sodded areas smooth and even. Use clean sand to fill any developing voids or unevenness in the sod surface. Unless otherwise indicated by the grading plans, the Contractor shall ensure that the finished grade of sod does not vary more than 2" from a 10' long straight edge.
B. Place Bermuda grass sod field as required to produce a smooth and even surface conforming to the grades indicated on the project civil engineering plans. All field areas shall be laser graded as required to produce the required surface finish. The Contractor shall ensure that the finished grade of sod does not vary more than ¼" from a 10' long straight edge. Remove any mesh backing on the Bermuda grass from the sod and from the project site.
C. Carefully place sod located on slopes so that rolling with a power roller is not necessary. Contractor may stake sod located around retention areas, along pavement areas or in swales. The Contractor is responsible for the repair of any erosion or relocation prior to the sod firmly rooting into the existing soil. Stakes, if used, shall not interfere with walking on, or the mowing of, the sodded areas.

D. The Contractor shall ensure that the finished grade of sod placed directly adjacent to buildings or other walls does not vary more than 2" from a 10' long straight edge.

3.10 CLEAN UP

A. Remove all debris, fertilizer bags, pallets etc. from the site upon completion of the work. Thoroughly sweep any paved areas including curbs and sidewalks.

3.11 WATERING

A. Watering of the sodded areas is the Contractor's responsibility.
B. Water sources shall be available and in operation prior to sodding for watering sodded areas.
C. If the permanent irrigation system is not available under this contract, the Contractor shall provide temporary irrigation facilities for watering as required to establish and maintain turf areas in a healthy and green condition. The Contractor shall provide water for areas of this work not covered by an irrigation system.

3.12 APPLICATION OF FERTILIZER

A. Fertilize Bermuda sod both 30 and 60 days after installation, and request an inspection to verify the application of the fertilizer.

3.13 Rolling and Topdressing of the Sod:

A. Within one month of the laying the sod pieces, firmly press the sod into contact with the sod bed by rolling with a suitably sized mechanical roller or other approved equipment. The rolling operation shall provide a smooth and even surface conforming to the grades shown on the grading plan, and insure knitting of sod without displacement of sod or deformation of the surfaces.
B. All developed unevenness or depressions in the lawn surfaces shall be top dressed as required to achieve a smooth and even finish. Top dressing shall not be applied more than 1" thick. In the case that the lawn surface requires more than 1" of correction, remove, re-grade, and re-sod the uneven areas.

3.14 GUARANTEE AND REPLACEMENT

A. Contractor shall guarantee all sod work up until the end of the maintenance period. Contractor shall replace any defective or distressed grass materials at no additional cost to the Owner. During the guarantee period, it shall be the Contractor's responsibility to immediately replace any dead material.

3.15 COMPLETION AND ACCEPTANCE

A. Completion of work shall mean full compliance and conformity with the provisions expressed or implied in drawings and in the specifications. Upon satisfactory completion of the work, the Architect will perform an inspection of the work to determine if the sodding work is ready for acceptance.

3.16 MAINTENANCE PROVISIONS - BERMUDA GRASS

A. The Contractor shall be responsible for complete maintenance of all bermuda grass until:
    1. Final acceptance of the landscape and irrigation work by the Owner and the Architect, or
    2. Two months after completion of the Bermuda grass lawn installation whichever is later.

B. Maintenance shall include, but not be limited to:

1. Mowing all lawn areas no less than every week, and the removal of all visible amounts of grass clippings from the lawn areas. Do not cut the lawn in more than 1/4" increments. Mow Bermuda grass to an approximately 1.5" height.
2. Edging of all pavements and curbs no less than every week.
3. Eradication of all harmful insects (including ants).
4. Control of all lawn and soil diseases.
5. Watering and fertilizing as required to maintain all lawn areas in an excellent condition for plant growth and sports field use. Grass is required to be in a healthy and green condition at the time of final acceptance.
6. Eradication of all weeds in the lawns as necessary for the grass to conform to the specification in paragraph 2.1.
7. All other work as necessary for the specialty Contractor to ensure a high quality turf.

END OF SECTION

SECTION 03284 – LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. General Description Includes:
1. Underground irrigation system.
2. Pipe and fittings, valves, sprinkler heads, and accessories.
3. Automatic two-wire control system with communication to a central control software.
4. Excavation and backfilling for installation of underground system.
5. All necessary permits, licenses, and fees.

1.2 SYSTEM DESCRIPTION

A. Layout design:
1. Full and complete coverage is a requirement. Contractor shall, at no additional costs to the Owner, modify layout, make necessary adjustments, as needed to obtain full coverage without overthrow on roadways, pavements, structures, furniture, fountains or buildings and to protect trees and shrubs from close high spray velocity.
2. Provide irrigation layout with separate plant type zones:
   a. Lawn (seed and sod)
   b. Plant beds containing Groundcover, Perennials, Shrubs and/or Trees
3. Provide flow velocities that do not exceed 5.0 ft. per second.
4. Provide irrigation of lawn areas with no overspray into planting beds or pavements, unless so designed on the drawings.
5. Provide independent irrigation of individual bed zones or planters.

B. Only similar types of heads with matched precipitation rates may run on same zone.

C. Piping Design: Do not mix different heads for each line. Provide main size as needed for proper flow, but not less than specified on plan.

D. Provide electric solenoid controlled underground irrigation system manufactured especially for control of automatic circuit valves of underground irrigation system. Provide unit of capacity to suit number of circuits indicated.
1. Source Power: 120 volts
2. Low Voltage Controls: 24 volts AC.

E. Provide controller to control all zones.

F. The extent of the irrigation system is shown on the Drawings.

1.3 SUBMITTALS - REVIEW

A. Product Data: Submit manufacturer’s technical data and installation instructions for all components and equipment used.

B. Shop Drawings:
1. Indicate piping layout to water source.
2. Include piping layout and details illustrating location and types of sprinkler heads, valves, control system and wiring diagram showing routes, wire sizes, wiring details and source of current and connections, and schedule of fittings.
3. Indicate location of sleeves under pavements and conflicts with existing utilities.

1.4 SUBMITTALS - CLOSE-OUT

A. Comply with the requirements of the General Conditions.

B. Record Drawings:
1. Prepare a map diagram showing location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number, and type of irrigation. "As-built" drawings must be approved before charts are prepared.
2. Provide one chart per controller showing the area covered by each satellite controller. The chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door. A second full-sized copy of each chart is to be given to the Landscape Architect.
3. The chart shall be a photographically reproduced print with a different color used to show coverage for each station. When completed and approved, the chart shall be hermetically sealed between two pieces of clear plastic. Charts must be completed and approved prior to final inspection of the irrigation system.
4. At the time of the irrigation mainline test, provide a preliminary set of "Record" drawings to the Owner.

C. Operation and Maintenance Data:
1. Provide schedule indicating length of time each valve is required to be run to provide a determined amount of water.
2. Include complete parts list with manufacturer's designations for each component.

D. Loose Equipment to Furnish: Loose irrigation equipment, operating keys and spare parts will be furnished by the Irrigation Contractor in quantities below:
1. Two (2) quick coupler keys and matching swivel hose ells for ¾" garden hose.
2. Two (2) valve keys for gate valves.
3. Two (2) keys for each controller.
4. Two (2) of each type of sprinkler used on project, complete with housings.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications: Single firm specializing in irrigation work with a minimum of five years experience properly installing irrigation systems of comparable size. Crew leader is to hold a certification of competence in irrigation design or installation.
1. Provide references of your last five consecutive systems, and five systems of comparable size with bid proposal.

B. Multiple units: when two or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.

C. Materials, equipment, and methods of installation shall comply with the following codes and standards:
1. State of Alabama Building Codes.
2. American Society for Testing and Materials (ASTM).
3. National Sanitation Foundation (NSF).

D. Nameplates: Nameplate bearing manufacturer's name or identification trademark securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

E. Requirements of Regulatory Agencies:
1. All work and materials shall be in full accordance with the latest rules and regulations of safety orders of Division of Industrial Safety; the Uniform Building Code and other applicable laws or regulations, including any local Plumbing Codes.

2. Should the Contract documents be at variance with the rules and regulations, notify the Owner for instructions before proceeding with work affected.

F. Testing:
1. Preliminary review of completed main line and wire installation will be made prior to backfilling of trenches and hydrostatic testing.
2. Final review and testing shall be made in conjunction with the final review of lawn, shrub, and tree planting. The irrigation system must be operational for 14 days prior to this final inspection. Any failures are to be corrected and the testing cycle is to be repeated.
3. Contractor is to notify Landscape Architect three days prior to testing.

G. Permits and Inspections:
1. Any permits for the installation or construction of any work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the contractor, each at the proper time.
2. The Contractor shall also arrange for and pay all costs in connection with any inspection and examination required by these authorities.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver irrigation system components in manufacturer's original, undamaged, and unopened containers, with labels intact and legible.

B. Deliver plastic pipe in bundles, packaged to provide adequate protection of pipe ends.

C. Store and handle materials to prevent damage and deterioration.

D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced to prevent installation delays.

E. Contractor is responsible for materials through final acceptance.

1.7 PROJECT CONDITIONS

A. Protect existing trees, plants, and lawns and other features designated to remain as part of the final landscape.

B. The Contractor shall carefully coordinate with the landscape work and other site developments, including all new and existing utilities.

C. The Contractor shall verify the correctness of all finish grades within the work area to ensure the proper soil coverage of the irrigation pipes.

D. Irrigation system layout is diagrammatic. Exact location of piping, sprinkler heads, valves, and other components shall be established by Contractor in the field at time of installation.

E. Where possible sprinkler head layout should match drawings as closely as possible. Field stake line and head locations for coordination with landscape contractor and approval by Landscape Architect prior to installation. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched wherever possible.

F. Space sprinkler components as indicated. Do not exceed sprinkler spacing shown on Drawings.

G. Locate existing utilities in areas of work. If utilities are to remain, provide adequate means of protection during the system installation. Repair utilities damaged during the work to the satisfaction of the Utility Owner and at the Contractor's expense. Notify local Utilities Protection Service 48 hours before start of construction.

H. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, notify the Owner immediately for direction as to procedure. Cooperate with the Owner and Utility companies in keeping active services and facilities in operation.

I. Minor adjustments in system layout will be permitted to clear existing field obstruction. Final system layout shall be acceptable to the Landscape Architect.

1.8 WARRANTY

A. Warranties are subject to the General Conditions and Supplementary Agreements.

B. Irrigation Contractor is responsible to ensure complete coverage as specified herein of the areas to be irrigated. During the warranty period the Irrigation Contractor shall make any adjustments as necessary to maintain proper coverage.

C. The Contractor shall guarantee all parts and labor for a period of one year from the date of final inspection. If within that period settlement occurs, and adjustments in pipes, valves and sprinkler heads, lawn areas or paving are necessary to bring the system, grade or paving to the proper level of the permanent grades, the Contractor, as part of the work under his Contract, shall make all adjustments without extra cost to the Owner, including the restoration of all damaged planting, paving or other improvements of any kind.

1.9 OPERATION & MAINTENANCE — IRRIGATION SYSTEM

A. It is the Landscape Contractor's responsibility to determine water application rates and controller cycling. The Irrigation Contractor will coordinate system installation with planting soil placement and planting activities. The Irrigation Contractor will also instruct the Landscape Contractor on the operation and programming of the controller and will assist the Landscape Contractor as necessary in such operations throughout the one-year maintenance period. Any adjustments, repairs, etc., other than programming, are the total responsibility of the Irrigation Contractor.

B. As part of this contract, the Irrigation Contractor shall winterize the system the first year and provide written instructions to the Owner for future service and maintenance. The Irrigation Contractor shall return to the site during the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation, and maintenance.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyl (PCB) or other hazardous materials identified by the Owner.

2.2 IRRIGATION SYSTEM MANUFACTURERS

A. All irrigation system components shall be supplied by regionally authorized distributors to provide single source responsibility for warranty service and operations to conform to specifications in all aspects.

2.3 MATERIALS

A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of this system.

B. Plastic Pipe
1. All piping shall be from virgin parent material. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents. All pipe shall be National Sanitation Foundation (NSF) approved.
2. For all mainline piping 3" and over, use SDR 21, Class 200 gasketed PVC bell & spigot pipe.

3. For all other irrigation piping, use polyvinyl chloride (PVC) 1120 with a minimum class rating of 200, sized to maintain a maximum flow velocity of less than 5 ft. per second (FPS).
4. Outside diameter of pipe shall be the same as iron pipe.
5. Pipe shall be marked at intervals (not to exceed 5') with the following information: Manufacturer's name or trademark, nominal pipe size, schedule, PVC type and grade (i.e. PVC 1120), SDR rating class, working pressure at 73 degrees F. and NSF approval.
6. Caution should be utilized in handling Type I pipe due to the possibility of cracking or splitting when dropped or handled carelessly.
7. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench.
8. Comply with pipe sizes indicated on drawings. No substitution of smaller pipe will be permitted. Larger sizes may be used subject to acceptance of the Landscape Architect. Remove damaged and defective pipe from site.
9. All PVC pipe to be furnished in 20' lengths.
10. Acceptable Manufacturer:
    (a) Silverline Plastics or approved equivalent

C. Piping for Sleeving
1. For sleeves less than six inches in size, use high impact type, polyvinyl chloride (PVC) 1120, minimum Schedule 40.
2. Sleeves six inches and above in size shall be Polyvinyl Chloride (PVC) 1120 Class 200.
3. Irrigation Contractor shall be responsible for the coordination of sleeves for all piping passing through concrete curbing, under paved areas, concrete or masonry walls and floors while the same are under construction.
4. Acceptable Manufacturer:
    (a) Silverline Plastics or approved equivalent

D. Fittings, 2.5" and Smaller
1. Schedule 40 or 80, polyvinyl chloride (PVC), Type 1 injection molded fittings suitable for solvent weld or threaded connections. Fittings made of other materials are not permitted.
2. Threaded PVC nipples shall be Schedule 80. Use high quality grade of Teflon tape for threaded fittings.
    (a) Saddle fittings are not permitted.
    (b) Use high quality grade of Teflon tape for sprinkler head and electric control valve connections.
3. Acceptable Manufacturer:
    (a) Spears Manufacturing or approved equivalent

E. Fittings, 3" and Larger
1. Fittings shall be manufactured of ductile iron. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F-477.
2. Transition gaskets are not allowed.
3. Acceptable Manufacturer:
    (a) Harco or approved equivalent

F. Lubricant for Assembling Gasket Pipe and Fittings
1. Water soluble, non-toxic, and shall be non-objectionable to taste and odor imparted to the fluid contained therein, non-supporting to bacteria growth, and shall have no deteriorating effect on PVC and rubber gaskets.

G. Isolation Valves, 2.5" and Smaller
1. Gate valves under 3" shall be 200 PSI rated W.O.G. 200 with bronze bodies. Valves shall be equipped with tee handles.

2. The valve shall have a 100% urethane coated wedge insuring a bubble-tight seal up to 200 PSI. The valve shall be fusion-bonded epoxy coated with PVC push-on, threaded or mechanical connections and a two-inch square nut for vertical valve stem key.
3. Acceptable Manufacturer:
   (a) Nibco TI-8 or approved equivalent

H. Isolation Valves, 3" and Larger
1. Valves 3" and larger shall be 200 PSI rated with iron bodies. Valves shall be equipped with square nut handles.
2. The valve shall have a double-disc inclined seat and non-rising stem, meeting AWWA Standard C509.
3. Acceptable Manufacturer:
   (a) Clow Valve Company or approved equivalent

I. Quick Coupling Valves
1. Valve shall be of two-piece construction with a one-inch female top thread with vinyl cover.
2. Furnish one valve key fitted with one-inch swivel hose ells.
3. All quick coupling valve keys and hose swivels shall be of the same manufacturer as the quick coupler.
4. Acceptable Product:
   (a) Rain Bird model 5RC or approved equivalent

J. Valve Boxes
1. Tapered rib reinforcement enclosure of rigid tensile strength plastic material components chemically inert and unaffected by moisture, ultraviolet light, corrosion, and temperature changes. Lid and base shall withstand normal loads exerted by turf equipment without collapsing. Box and lid to be black.
2. For remote control valves use rectangular standard turf box, 16" x 12".
3. For Isolation valves and quick coupler valves use 10" circular turf box.
4. Acceptable Manufacturer:
   (a) Rain Bird PVB or approved equivalent

K. Spray Heads
1. Full or part circle pop-up fixed spray sprinkler.
2. The sprinkler body, stem, nozzle, and screen shall be constructed of heavy-duty, ultra-violet resistant plastic. It shall have a heavy-duty stainless steel retract spring for positive pop-down and a ratcheting system for easy alignment of the pattern. The sprinkler shall have a soft elastic pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem as it retracts into the case to prevent the sprinkler from sticking up to minimize "flow-by." The sprinkler shall have a matched precipitation rate (MPR) plastic nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing under the nozzle; protective, non-clogging filter screens or pressure compensating screens. The screen shall be used in conjunction with the regulating screw for regulating.
3. The sprinkler shall have a flush plug reinstalled. The plug shall prevent debris from clogging the sprinkler during installation and allow for system to be flushed before installing nozzles. The plug shall be bright orange in color and constructed of polypropylene material.
4. Sprinklers subject to low head drainage shall have integral check valves capable of holding back to 7' of head. Such sprinklers shall be clearly marked with "SAM" on top.
5. The sprinklers shall also include an integral pressure-regulating device (PRS) where noted on the Drawings. These units shall be identifiable from the top with the marking "PRS" on top.
6. Pop-up heights: 4 inches, 6 inches and 12 inches (see drawings).
7. Spray nozzles for sprinkler heads shall be of the same manufacturer as the spray head.
8. Acceptable Product:
   (a) Rain Bird model 1800 or 1800SAMP45 or approved equivalent

L. Mid-Range Turf Rotors

1. The full or part circle rotor sprinkler shall be a single stream, water lubricated, gear drive.
2. The part circle sprinkler shall have adjustable arc coverage from 30 to 350 degrees.
3. The sprinkler shall have a thread-on nozzle assembly whose installation shall not require any tools. The arc adjustment shall not require any tools.
4. The sprinkler shall have a pressure-activated multi-function wiper seal that positively seals against the nozzle flange to keep debris out of the rotor and to clean debris from the pop-up stem as it retracts. The wiper seal shall prevent sprinkler from sticking up and be capable of sealing the sprinkler cap to sprinkler body under normal operating pressures.
5. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. It shall have a 3/4” bottom inlet.
6. The sprinkler shall have a stainless steel retract spring for positive pop down.
7. The sprinkler shall have an adjusting screw capable of reducing the radius by up to 25%.
8. Pop-up heights: 4 inches and 12 inches (see drawings).
9. Acceptable Products:
   (a) Rain Bird model 5000 or approved equivalent

M. Long-Range Turf Rotors

1. The part or full circle sprinkler shall be a single stream, water lubricated, gear drive type.
2. Arc adjustment can be performed with or without the rotor in operation and shall require only a flat blade screwdriver.
3. The sprinkler shall have a rotating nozzle turret independent of the riser stem. The portion of the riser stem that is in contact with the wiper seal shall be non-rotating.
4. The sprinkler shall have a pressure activated, multi-function, wiper seal that will clean debris form the pop-up stem as it retracts. This wiper seal shall prevent the sprinkler from sticking in the up position and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures.
5. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system.
6. The sprinkler shall have a standard rubber cover. Exposed surface diameter not to exceed 2”.
7. The sprinkler shall have a front-loading nozzle assembly, which will allow the nozzle to be installed without a stator bushing change.
8. The sprinkler shall have a stainless-steel adjusting screw capable of reducing radius by 25%.
9. The sprinkler shall have a standard Seal-A-Matic (SAM) device capable of holding up to ten feet (10’) of head.
10. Acceptable product:
    (a) Rain Bird 6504 series rotor model or approved equivalent

N. Automatic Controller, 2-Wire

1. The controller shall be of a hybrid type that combines electro-mechanical and microelectronic
2. circuitry capable of fully automatic or manual operation. The controller shall be housed in a stainless-steel pedestal with a key-locking door suitable for outdoor installation.
3. The controller shall have a base station capacity of 50 stations with two additional expansion slots capable of receiving modules to create a controller capacity of up to 200 stations. Station timing shall be from 0 minutes to 12 hours.
4. The controller shall have a Seasonal Adjustment by program which adjusts the station run time from 0 to 300% in 1% increments. The controller shall also have a Monthly Seasonal Adjustment of 0 to 300% by month. Station timing with Seasonal Adjustment shall be from 1 second to 16 hours.
5. The controller shall have 4 separate and independent programs which can have different start times, start day cycles, and station run times. Each program shall have up to 8 start
6. times per day for a total of 32 possible start times per day. The 4 programs shall be allowed to overlap operation based on user defined settings which control the number of

simultaneous stations per program and total for the controller. The controller shall allow up to 8 valves to operate simultaneously per program and total for the controller including the master valves.

7. The controller shall have a 365-day calendar with Permanent Day Off feature that allows a day(s) of the week to be turned off on any user selected program day cycle. (Custom, Even, Odd, Odd31, & Cyclical). Days set to Permanent Day Off shall override the normal repeating
8. schedule and not water on the specified day(s) of the week. The controller shall also have a Calendar Day Off feature allowing the user to select up to 5 dates up to 365-days in the future when the controller shall not start programs.
9. The controller shall incorporate a Rain Delay feature allowing the user to set the number of days the controller should remain off before automatically returning to the auto mode.
10. The controller shall have Cycle+Soak water management software which can operate each station for a maximum cycle time and a minimum soak time to reduce water run-off. The maximum cycle time shall not be extended by Seasonal Adjustment.
11. The controller shall incorporate an optional FloManager feature providing real-time flow, power, and station management. FloManager shall manage the number of stations operating at any point in time based on water source capacity, station flow rate, number of valves per station; user-defined simultaneous stations per program and for the controller. FloManager shall incorporate the ability to provide station priorities to determine the order in which stations shall operate. The controller shall ignore the station number and instead operate the highest priority stations first and the lower priority stations last when FloManager is enabled. FloManager shall be an option that is disabled by default and the controller shall operate zones in order of station number, started with the lowest numbered zone set to irrigate and ending with the highest number zone.
12. The controller shall offer Water Windows for each program. This function sets the allowed start and stop time where watering is allowed. If the watering cannot be completed by the time the Water Window closes, the stations with remaining run time are paused and watering automatically resumes when the Water Window opens the next time.
13. Acceptable Product:
    (a) Rain Bird ESP-LX-IVMP series or approved equivalent

O. Line Decoders

1. The factory pre-coded decoders shall be fully waterproof and have a working range shall be 0 degrees C to 50 degrees C at up to 100% humidity.
2. Decoders shall be capable of operating from one to six solenoids depending on the model specified on the Drawings
3. Four and six address decoders shall have integral surge protection.
4. Acceptable Product:
   (a) Rain Bird LD series or approved equivalent

P. Control Wire

1. Two conductors of single strand solid copper wire type, with PVC jacket. UF 600-volt AWG #14 minimum size approved for direct burial. For runs over 2,000 L.F. use AWG #12. Contractor is to verify that wire sizes are within recommended wire run lengths for proper solenoid operation.

Q. Flow Sensor Cable

1. Direct-burial, polymer coated aluminum shielded, insulated, 1 pair multi conductor, with polyethylene outer jacket for connecting flow sensors with satellite controllers.
2. Two 20 AWG foil shield w/drain, black jacket, rated for direct burial BLK, WHT. Two conductor direct burial shielded cable used with all field sensor connections to satellites such as flow sensors. Cables not to exceed 609 meters (2000 feet) in length.

R. Rain Shutoff

1. One device shall be provided for each controller. Install per manufacturer's latest printed instructions.
2. Verify with Landscape Architect as to final location of rain shutoff.
3. Acceptable Product:
   (a) Rain Bird WR2-RFC or approved equivalent

S. Remote Communication and Control

1. The irrigation central control system shall be the IQ™ Platform as hereafter specified and as shown on the drawings. The system shall be fully programmable, providing the operator with absolute and full control of the entire control system. The system shall provide a degree of flexibility such that, in effect, anything that could be done at the satellite controller shall be capable of being done at the central computer.
2. The system shall have a Windows® graphical user interface (GUI) that allows easy programming and graphical depiction of the satellite controller programming.
3. The system shall be compatible with the ESP-LXME Series traditionally-wired controllers with 1 to 48 station capacity. The system shall also be compatible with ESP-LXD Series Two-wire decoder controllers with 1 to 200 station capacity. The system shall have an adjustable satellite controller capacity allowing the customer to expand the system capacity over time.
4. The system shall allow virtual log-on passwords to administer access privileges to multiple users of the system. The system shall support multiple languages including English, Spanish, French, German, Italian, and Portuguese. The system shall also support user defined date/time, number, and unit formats
5. The system shall allow virtual site configurations, allowing the user to group satellite controllers into a site to simplify common adjustments. The system shall incorporate a satellite controller dry-run feature that graphically depicts the program operation, showing minute-by-minute program activity, expected flow rates, and the programs/stations operating at any point in time. The system shall incorporate program adjust values for each satellite controller program. The system shall also include a site-level daily or monthly seasonal adjust percentage that adjusts the station run times for all satellite controllers in the site. The system shall also offer site-level daily or monthly ET value adjustments as an alternative to seasonal adjustment percentage.
6. The software shall utilize NCC Network Communication Cartridges to interface with the system controllers. The cartridges shall be available with internal 3G Cellular, Ethernet, & Wi-Fi modems or RS-232 external modem port. The cartridges installed in the controller shall be field configurable as a Direct, Server, or Client Satellite. The Server satellite shall share its IQ central computer communication link with up to 149 Client satellites and be capable of sharing weather sensors and master valves amongst the 150 satellite controllers. The software shall incorporate a site configuration utility that contacts the satellite controller, reports the hardware configuration, and retrieves the configuration and programming data. The software shall verify the satellite hardware configuration has not changed each time it contacts the satellite controller. The controller and NCC cartridge firmware shall be upgradeable from the system central computer. The software shall be capable of manually starting a program, test program, or station on any satellite controller. The software shall be capable of overriding the satellite controller Auto/Off dial position and sensor Active/Bypass switch position.
7. Satellite controllers equipped with flow sensors shall provide a learn flow utility to measure the nominal flow rate of each station. The learn flow rate shall be compared to the actual flow sensor flow rate each time the station operates. A user defined percentage above and below the learned flow rate shall be used to determine if the flow rate is problematic. User defined reactions shall be programmable including a diagnose mode where the cause of the problem flow rate is identified, and the problem station or water source is shut off. A manual MV water window shall be provided to automatically open the master valve and account for manual watering flow rates without turning off the flow sensing functions of the satellite controller. Both normally closed and open master valves shall be supported. All flow sensing features shall be programmable through the software. The system shall offer user definable station-level

priorities and a program-level water window. Stations are selected to operate based on their priority with high priority stations operating first. If a program cannot complete the run time of all stations in the water window the station operation shall be paused and resumed at the start of the next water window.

8. The system shall provide user definable number of simultaneous stations to operate per program and for the whole satellite controller. The combination of these features shall be used to automatically shorten the overall operating time of the satellite controller programs. All features listed shall be programmable through the software. The system shall provide automatic communication and email reports.
9. The system shall provide satellite controller PIN code lock-out and 2-way programming. Each satellite shall have minimum of 5 assigned PIN-codes. Lockout options shall include full or partial lockout. All PIN-codes shall be programmed through the software. The system shall provide automatic program adjustment-based management allowed depletion scheduling. ET/rain weather sources shall include CIMIS Internet, ETMI Weather Reach, and WSPROLT and WSPRO2 Weather Stations, and IQ Global Weather. The system shall provide minute-by-minute flow logs in a graph comparing actual flow and projected flow. Actual flow totals shall be included in the automated email reports.
10. Acceptable Product:
    (a) Rain Bird model IQ-3G-USA or approved equivalent

T. Flow Sensor

1. The flow sensor shall be an in-line type with a nonmagnetic, spinning impeller (paddle wheel) as the only moving part. The electronics housing shall be glass-filled PPS. The impeller shall be glass-filled nylon or Tefzel with a UHMWPE or Tefzel sleeve bearing. The shaft material shall be tungsten carbide.
2. The electronics housing shall have two, ethylene propylene O-Rings and shall be easily removed from the meter body. The sensor electronics will be potted in an epoxy compound designed for prolonged immersion.
3. Electrical connections shall be 2 single conductor 18 AWG leads 48 inches long. Insulation shall be direct burial “UF” type colored red for the positive lead and black for the negative lead.
4. The sensor shall be capable of operating in line pressure up to 100 PSI and liquid temperatures up to 140° F and operating in flows of ½ foot per second to 30 feet per second with linearity of ±1% and repeatability of ±1%.
5. The meter body shall be fabricated from brass, sized per Drawings, with threaded end connections.
6. Acceptable Products:
    (a) Rain Bird model FS200B or approved equivalent

U. Control Valves

1. The electric control valve shall be a normally closed 24 VAC 50/60 Hz (cycles/sec) solenoid actuated globe/angle pattern design. The valve pressure rating shall be at least 150 PSI.
2. The valve shall have manual open/close control (internal bleed) for manual opening and closing of valve without electrically energizing the solenoid. The valve’s internal bleed shall prevent flooding of the valve box.
3. The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing, and a leverage handle for easy turning. This 24-VAC 50/60 Hz solenoid shall open with 19.6 VAC minimum at 200 PSI. At 24 VAC, average inrush current shall not exceed 0.41 amps. Average holding current shall not exceed 0.28 amps.
4. The valve shall have a flow control stem for accurate manual regulation and/or shut off of outlet flow. The valve must open or close in less than 1 minute at 150PSI and less than 30 seconds at 20 PSI.

5. The valve construction shall provide for all internal parts to be removable from the top of the valve without disturbing the valve installation. The body shall have a removable O-ringed plug for installation in either globe or angle configuration.
6. Acceptable Product:
   (a) Rain Bird model PGA or approved equivalent

V. Master Valve
1. The electric control valve shall be a normally open 24 VAC 50/60 Hz (cycles/sec) solenoid actuated globe/angle pattern design. The valve pressure rating shall be at least 150 PSI.
2. The valve body and bonnet shall be constructed of brass with stainless steel screws.
3. The valve shall have manual open/close control (internal bleed) for manual opening and closing of valve without electrically energizing the solenoid. The valve's internal bleed shall prevent flooding of the valve box.
4. The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing.
5. The valve shall feature a self-cleaning inlet orifice with metering rod allows only "clean water" to enter upper diaphragm chamber offering consistent, trouble-free operation. The valve construction shall provide for all internal parts to be removable from the top of the valve without disturbing the valve installation.
6. Acceptable Product:
   (a) Buckner Superior model 3100 or approved equivalent

W. Accessory materials
1. Drainage fill at valve boxes:
   (a) Provide 1" washed pea gravel in each valve box.
2. Suitable excavated materials removed to accommodate the irrigation system work shall be used as fill materials provided it conforms to the requirements of fill as noted above.

X. PVC Solvent Cement:
1. Provide professional grade cement, Whitlam #PR32 or approved equivalent for PVC pipe and fittings.

Y. PVC Primer/Cleaner
1. Provide professional grade primer/cleaner, Whitlam #PP32 or approved equivalent primer.

PART 3 - EXECUTION

3.1 GENERAL

A. Lay out work as accurately as possible to Drawings. Drawings are diagrammatic to the extent that swing joints, offsets, and fittings are not shown.

B. The Irrigation Contractor shall carefully schedule his work with the Landscape Contractor and all other site developments.

C. Sleeves are required wherever piping or electrical wires are placed under paved surfaces. (Installed as part of other sections and Contract). Irrigation Contractor is responsible for coordination of all sleeves.

D. Full and completed coverage is required. Contractor shall make any necessary minor adjustments to layout as required to achieve full coverage of irrigated areas at no additional cost to the Owner.

E. Where piping is shown on drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. Do not install directly over another line in the same trench.

F. It shall be the Contractor's responsibility to establish the location of all sprinkler heads to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on drawings. No substitution of smaller pipe sizes will be permitted, but substitutions of larger sixes may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.

G. Install irrigation system after completion of site grading, the irrigation system shall be installed and completely operational three days prior to the installation of any planting operations.

3.2 POINT OF CONNECTION

A. Provide irrigation system complete from point of connection. See Drawings for Point of Connection (POC).

3.3 EXCAVATING

A. All piping is to be trenched, other than one inch which may be pulled.

B. Excavate to depths required to provide six inches of Granular Fill bedding material under paved surfaces.

C. Should utilities not shown on the plans be found during excavations, the Contractor shall promptly notify the Owner for instructions as to further actions required. Failure to do so will make Contractor liable for all damage thereto arising from his operations after discovery of such utilities. Indicate such utility crossings on the record drawings promptly.

D. Install main line irrigation lines with a minimum cover of eighteen inches and a maximum cover of twenty-four inches based on finished grades.

E. Install lateral irrigation lines with a minimum cover of twelve inches and a maximum cover of twenty-four inches based on finished grades.

F. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations, to their original condition.

G. Trenches shall be open, vertical sided construction wide enough to provide free working space around work installed and to provide adequate space for backfilling and compacting.

H. When two pipes are to be placed in the same trench, a six-inch space is to be maintained between the pipes. The Contractor shall not install two pipes with one directly above the other.

I. The Contractor shall cut trenches for pipe to required grade lines and compact trench bottom to prove accurate grade and uniform bearing for the full length of the line.

J. The Contractor shall be held responsible for damages caused by these operations and shall immediately repair or replace damaged parts.

3.4 PIPELINE ASSEMBLY

A. General
1. Install pipes and fittings in accordance with manufacturer's latest printed instructions.
2. Clean all pipes and fittings of dirt, scales, and moistures before assembly.
3. All pipe, fittings, and valves, etc., shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when laying is not in progress, open ends of pipe shall be closed by approved means.
4. All lateral connections to the main line as well as all other connections shall be made to the side of the main line pipe. No connections to the top of the line shall be allowed.

B. Solvent-Welded Joints for PVC Pipe

1. Use solvents and methods approved by solvent and pipe manufacturers.
2. Cure joint a minimum of one hour before applying any external stress on the piping and at least twenty-four hours before placing the joint under water pressure, unless otherwise specified by the manufacturer. Cut all pipe with square ends and remove burrs, ridges, and dirt. Check dry fit pipe and fitting. Clean pipe and fitting with purple primer and apply thin coat of cement to fitting with a liberal coat to pipe. Quickly push pipe fully into fitting using a ¼ turning motion. Hold pipe and fitting together a minimum of 30 seconds, wipe off excess with cloth.

C. Threaded Joints for PVC Pipe
1. Use Teflon tape on all threaded PVC fittings.
2. Use strap-style friction wrench only. Do not use metal-jawed wrench.

D. Laying of Pipe
1. Pipes shall be bedded in at least in at least two inches of finely divided material with no rocks or clods over one-inch diameter to provide a uniform bearing.
2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
3. Do not lay PVC pipe when there is water in the trench.
4. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner to ensure that a square cut. Burrs at end cuts shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
5. All plastic-to-plastic joints will be solvent-weld joints or slip seal joints. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.

3.5 PVC SLEEVES AND ELECTRICAL CONDUIT

A. Provide all sleeves indicated and as otherwise required for the successful completion of the irrigation system. Coordinate sleeving efforts with General Contractor and the Owner.

B. All PVC sleeves shall be a minimum of twice the diameter of pipe to be sleeved.

C. All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wires. Electrical wires are not to be placed in the same trench with water pipes.

3.6 ISOLATION VALVES

A. Shall be installed in the following locations:
1. After backflow preventer and prior to main supply loop.
2. Between main line and each quick coupler valve.
3. As located on irrigation system drawings within lawn areas.

B. Install each isolation valve in an individual valve box with a six-inch (deep) layer of washed gravel below the bottom of the valve.

C. Seal threaded connections with Teflon tape.

3.7 IRRIGATION CONTROL VALVES

A. Coordinate location of all valve boxes with Landscape Architect. Do not proceed in uncertainty.

B. All irrigation control valves shall be installed with ductile iron service tees.

C. Install line size bronze gate valve on pressure side of each control valve. Locate in valve box with control valve.

D. Install each electric control valve in an individual valve box with a six-inch (deep) layer of washed gravel below the bottom of the valve.

E. Seal threaded connections with Teflon tape.

F. Valves shall be installed as shown in details and in accordance with manufacturer's instructions and specifications.

3.8 QUICK COUPLING VALVES

A. Shall be set a minimum of twelve inches from walks, curbs, or paved areas where applicable or as otherwise noted. Quick coupling valves shall be housed in standard size valve boxes.

B. All quick coupler valves shall be installed on to ductile iron service tee.

C. Install one-inch bronze gate valve on pressure side of each quick coupler valve. Locate in valve box with quick coupler valve.

D. Valves shall be installed on a three-elbow PVC Schedule 80 swing joint assembly.

E. Provide six-inch (deep) layer of washed gravel below the bottom of the valve. Top of quick coupler valves shall be as close to the top of the valve box as possible. Top of gravel layer shall be three inches below the top of the valve.

F. Quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the plans.

G. Quick coupler locations are to be staked in the field by installer for approval by Landscape Architect prior to installation.

3.9 VALVE BOXES

A. Valve boxes shall be set flush with grade in lawn areas and one-half inch (1/2") above finish grade in ground cover and shrub bed areas.

B. Install valve access boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the valve box.

3.10 SPRAY HEADS AND ROTORS

A. All sprinkler heads shall be pop-up type heads. Permanent shrub risers are not permitted.

B. All sprinkler heads within a zone shall have matched precipitation rates.

C. Install plumb to within 1/16", unless otherwise noted (see detail for heads on sloped areas on detail sheet). Top of collar (not nozzle) should be flush with finish grade.

D. Place part-circle pop-up sprinkler heads at least two inches and no more than six inches from edge of adjacent walks, curbs and mowing bands, or paved areas at time of installation.

E. Install pop-up sprinkler heads, and accessories in accordance with manufacturer's latest printed instructions, except as otherwise noted.

F. All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. Adjust where possible to prevent over spraying onto walks, pavement, or buildings.

G. Tighten nozzles on spray type sprinklers after installation. Adjust sprinkler adjusting screw as required for proper radius.

H. Install pop-up micro sprays with approved flexible ¼" polyethylene tubing with barbed fittings.

I. Install pop-up spray heads with approved flexible thick wall polyethylene swing pipe with spiral barb fittings. Do not install to side inlet of sprinkler head.

J. Install pop-up mid-range turf rotors with approved flexible thick wall polyethylene swing pipe with spiral barb fittings.

K. Polyethylene swing joints are not to be used to extend head more than 18” from lateral.

L. Heads to be installed at the top of a slope shall be tilted toward the toe of the slope. They shall also be installed slightly down from the top edge of the slope to decrease wind drift.

M. Mid-slope sprinkler heads shall be installed at an angle halfway between vertical and perpendicular to the slope. For example, a 2:1 or 50% slope has an angle of 26 degrees, so tilt the heads 13 degrees into the slope from the perpendicular.

N. Heads installed at the toe of the slope shall be tilted slightly away from the slope to avoid driving water into the slope directly in front of the sprinkler.

O. Do not mix different types of heads within a zone.

3.11 CONTROLLER

A. Mount the controller flush with the mounting surface. Controller should be level with the surface of the floor or concrete mounting pad. Install controller with display at eye-level.

B. Mount the controller pedestal with the mounting hardware and template supplied.

C. The automatic controller shall be installed at the approximate location shown on the Drawings. (Suitable power supply will be supplied as part of other sections and Contract).

D. All local and other applicable codes shall take precedence in connecting the 110-volt electrical service to the controller.

E. Install per local code, manufacturer’s latest printed instructions, and as detailed.

F. Valve control wires shall be numbered at the terminal strip.

3.12 CONTROLLER POWER SUPPLY

A. Power to the controller shall be supplied from a dedicated circuit (installed as part of work of other sections and Contract).

B. The Irrigation Contractor shall be responsible for all wiring and associated equipment to connect power supply to the controller.

C. All wiring is to be in accordance with local codes.

3.13 CONTROL WIRING

A. All electrical equipment and wiring shall comply with local and state codes and be installed by those skilled and licensed in the trade.

B. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines whenever possible and shall have a minimum of twelve inches cover.

C. Control wires shall be installed to the side of the main line whenever possible. Placement over pipes is not permitted.

D. Where more than one wire is placed in a trench, the wiring shall be taped together at intervals of twenty feet.

E. An expansion curl shall be provided within three feet of each wire connection and at least every one-hundred feet of wire length on runs of more than one hundred feet in length. Expansion curls shall be formed by wrapping at least five turns of wire around a one-inch diameter pipe, then withdrawing pipe.

F. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than five hundred and they must be in ten-inch round splice boxes that are green in color. The connector shall be 3M DBY splice kit by 3M Corporation, or accepted Substitute. Use one splice per connector sealing pack.

3.14 CLOSING OF PIPE AND FLUSHING OF LINES

A. All testing shall be done under the supervision of the Landscape Architect and Owner. Submit written requests for inspections to the Owner at least three days prior to the anticipated inspection date.
1. Thoroughly flush out all water lines under a full head of water before installing heads, valves, quick coupler assemblies, etc. Maintain flushing for a minimum of three minutes at the valve located furthest from water supply.
2. After flushing, cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. Leave in place until removal is necessary for completion of installation.
3. Test as specified below.
4. Upon completion of testing complete assembly and adjust sprinklers for proper distribution.

3.15 TESTING

A. Make hydrostatic when welded PVC joints have cured as per manufacturer's instructions.
1. Pressurized mainlines:
(a) Completely install water meter, mains, isolation valves and control valves. Do not open laterals.
(b) Open all isolation valves.
(c) Fill all lines with water and shut off at meter.
(d) Test piping at hydraulic pressure of 70 PSIG for one-half hour. Maximum loss shall be five PSI. Locate pump at low point in line and apply pressure gradually.
(e) Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping. Inspect each joint and repair leaks.
(f) Leaks resulting from tests shall be repaired and tests repeated until the system passes.

B. Non-pressurized laterals:
(a) Test piping after laterals are installed and system is fully operational.

3.16 INSPECTIONS

A. The contractor shall maintain proper facilities and provide safe access for inspection to all parts of the work.

B. Irrigation inspection shall consist of a minimum of:
1. Mainline pressure test.
2. Coverage test.
3. Final irrigation inspection.

C. If the specifications, the Owner's and/or Landscape Architect's instructions, laws, ordinances or any public authority require any work to be tested or approved, the contractor shall give the Owner three days' notice of its readiness for inspection.

D. The contractor shall be solely responsible for notifying the Owner and Landscape Architect where and when such work is in readiness or testing.

E. If any work should be covered up without the approval of the Owner and Landscape Architect it must be uncovered, if required, for examination at the contractor's expense.

F. No inspection will commence without "Record" drawings and without completing previously corrections, or without preparing the system for inspection.

3.17 BACKFILLING AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches.
   1. Restore all surfaces to match adjacent surfaces. Meet grades flush. Create smooth blends and transitions.

B. Granular fill corresponding with Section Earthwork shall be placed initially on all lines with a minimum of three inches cover. No foreign matter larger than one-half inch in size shall be permitted in the initial backfill.
   1. Trenches located under paving shall be backfilled with Granular Fill corresponding with the requirements of Section Planting Soil System (three inches above the pipe) compacted in layers.
   2. Backfill in lawns and planting beds shall be planting soils corresponding with the requirements of Section Planting Soil System. Coordinate backfilling of planting soils with the Landscape Contractor. Care should be taken to restore the planting soil profile in accordance with the Contract Documents. Planting soils damaged during trenching shall be discarded. The Landscape Architect shall be the sole judge as to the suitability of the planting soils for reuse.
   3. Surplus subgrade and planting soils remaining after backfilling shall be legally disposed of off-site by the contractor.

3.18 CLEANING AND DISPOSAL OF WASTE MATERIAL

A. Perform clean up during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment as fast as it accumulates.

B. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris.

END OF SECTION 32 84 00

SECTION 03292
HYDROSEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fertilizing.
   2. Hydroseeding.
   3. Mulching.
   4. Maintenance.

B. Related Sections:
   1. Section 03284 – Landscape Irrigation
   2. Section 03292 - Sodding
   3. Section 03293 – Landscape Planting

1.2 REFERENCES

A. ASTM International:
   1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. SCDOT Standard Specifications:
   1. Standard Specifications for Highway Construction, 2007, published by the South Carolina Department of Transportation.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Invoices or proof of purchase to verify quantities specified.

F. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; and, types, application frequency, and recommended coverage of fertilizer.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ALDOT Standard Specifications.

B. Maintain copy of document on site.

1.6 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

B. Installer: Company specializing in performing work of this Section withminimum 5 years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers showing percentage of seed mix, germination, inert matter and weeds; year of production; net weight; date of packaging; and location of packaging. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and nameof manufacturer.

1.8 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for minimum of three cuttings.

PART 2 PRODUCTS

2.1 TOPSOIL MATERIALS

A. Conform to Topsoil Specifications: Original surface soil typical of the area, which is capable of supporting native plant growth; free of large stones, roots, waste, debris, contamination, or other unsuitable material, which may be detrimental to plant growth; pH value of 5.4 to 7.0.

2.2 SEED MIXTURE

A. Furnish materials in accordance with ALDOT Standard Specifications.
B. Add Southeast Wildflower mix to either Tall Fescue or Common Bermudagrass season dependant

Tall fescue	500 lbs/acre
Common Bermudagrass	150 lbs/acre
Southeast Wildflower mix	50 lbs/acre

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. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis. When test is not available, use 10-10-10 mixture of Nitrogen, phosphoric acid, and soluble potash.

C. Lime: ASTM C602, Class T or Class O agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Herbicide: As required to combat type of weeds encountered.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Verification of existing conditions before starting Work.

B. Verify prepared soil base and topsoil are ready to receive the Work of this Section.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 6 lbs per 1,000 square feet evenly in one pass.

B. Apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

C. Planting Season:
1. Tall Fescue:
   a. September 1 through November 1
2. Bermudagrass:
   a. April 1 through July 1

3.4 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

3.5 SCHEDULE

A. Lawn Area: Mix Type 1, 4-inch top soil.

B. Pond Slopes: Mix type 2, 4-inch top soil.

END OF SECTION

SECTION 03293

LANDSCAPE PLANTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. CONTRACTOR shall furnish all labor, materials, supplies, equipment, tools and transportation; perform all operations to complete installation of the plantings; and guarantee all plantings. The WORK shall include, but not be limited to the following:

1. Procurement of all applicable licenses, permits, and fees.

2. Ascertainment of utility locations prior to construction.

3. Site inspection.

4. Planting of trees, shrubs, and wetland plants.

5. Soil preparation and fine grading.

6. Staking and guying of trees.

7. Mulching of all trees.

8. Cleanup, inspection, and approval.

9. Guarantee of all plantings.

1.02 GENERAL

A. No substitutions for specified materials shall be accepted in the base BID. Alternative BID proposals, which propose material substitutions, may be submitted for consideration by ARCHITECT. Alternative proposals shall be fully supported by necessary documentation showing compatibility/comparability with specified materials.

B. Additional WORK shall be paid for at CONTRACT unit prices. If unit prices are not available, the WORK shall be paid for on a time and material basis or for an agreed to lump sum amount.

C. Precautions have been taken to ensure accuracy and conformance of the CONTRACT DOCUMENTS with the design concept of the PROJECT. Nevertheless, CONTRACTOR shall be responsible for confirming and correlating actual job site dimensions, for acquiring information that pertains solely to the fabrication process or to techniques of construction, and for coordinating the WORK with all other trades.

1.03 RELATED SECTIONS

A. The following is a list of SPECIFICATIONS which may be related to this section:

1. Section 01 57 19, Temporary Environmental Controls

2. Section 31 41 13 Topsoil and Wetland Topsoil Stripping and Stockpiling

3. Section 31 23 00 Excavation and Fill

4. Section 31 25 00 Erosion and Sedimentation Controls

5. Section 32 93 00 Landscape Planting

6. Section 32 92 19 Seeding

1.04 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Nursery and Landscape Association (ANLA): ANSI Z60.1, American Standard for Nursery Stock.

1.05 SUBMITTALS

A. CONTRACTOR shall direct submittals and samples, if noted, to ARCHITECT and receive approval in writing before WORK commences.

B. Submit Topsoil an certifications as required

C. Submit Weed free Certification and mulch sample for approval.

D. Submit organic compost certification of characteristics for approval.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Digging, Wrapping, and Handling:

1. Plants shall be dug and prepared for shipment in a manner that shall not cause damage to branches, shape, and future development after planting.

2. Balled and burlapped plants shall be nursery grown stock adequately balled with firm, natural balls of soil in sizes and ratios conforming to the American Standard for Nursery Stock as cited below. Balls shall be firmly wrapped with non-treated burlap, secured with wire or jute. Broken or flattened or otherwise misshaped or otherwise damaged root balls will not be accepted.

B. Plants are to be delivered to the site with tags bearing the botanic name as indicated by the plant list.

C. Plant Protection: Plants shall be handled so that roots are adequately protected at all times from drying out and from other injury. Plant materials shall be securely tarped during transportation to prevent wind burn. Protect root balls and pots of plants which cannot be planted within twelve (12) hours of delivery with soil or other suitable materials. Where possible, store plants in the shade. Keep all plant roots

moist before, during, and after planting. Plants shall be watered as soon as they arrive on the site and shall be kept moist until they are planted.

D. Protect all materials used for construction from damage, deterioration, or loss of any kind while in storage and construction.

1.07 GUARANTEE AND REPLACEMENT

A. Guarantee trees, shrubs, ground covers, and other plant materials to root and thrive free from defects from any cause until final acceptance of PROJECT.

B. Replace plants when they are no longer in a satisfactory condition as determined by ARCHITECT prior to final acceptance. This includes plants that die back and loose the form and size originally specified.

1. Make replacements within seven (7) days of notification from ARCHITECT.

2. Replace trees in the spring planting season only, unless approved otherwise. Remove dead plants within two (2) days of notification.

C. All replacements shall be of the same kind and size as originally specified and shall be installed as described in the CONTRACT DOCUMENTS. Repairs and replacements shall be made at no expense to OWNER.

D. Guarantee shall apply to originally specified and installed plants and other landscape materials, and any replacements made during the construction period.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials used for construction shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

B. A complete list of plantings and necessary landscape material is provided on the DRAWINGS.

2.02 SOIL AMENDMENTS/FERTILIZERS/MULCHES/EDGING

A. Topsoil:

1. Topsoil shall meet the requirements of specifications.

2. In-Situ: Soil in-place on the site, such as tree pit excavation, may be used provided it is free from roots, limbs, rocks, construction debris, and other foreign material.

B. Improved Planting:

1. Mix (Prepare Soil): Backfill planting pits and planters using an improved soil mix consisting of the following:

a. Eighty five percent (85%) onsite or imported topsoil.

b. Fifteen percent (15%) organic compost.

C. Fertilizer:

1. Trees and Shrubs: Osmocote Sierrablen, nine- (9-) month slow-release.

2. Turf Grasses: 18-46-0 at five pounds (5#) per thousand square feet (1,000 SF).

3. Native Grasses: Biosol at a rate of twenty pounds (20#) per thousand square feet (1000 SF).

D. Herbicide: Coordinate type of herbicide with ARCHITECT.

E. Mulch: Three- (3-) inch depth shredded cedar mulch or equal cedar mulch; free from noxious weed seed and all foreign material harmful to plant life. Chips or other angular bark chips are not acceptable.

F. Edging: Steel edging, inter-locking ¼" gauge by six- (6-) inch painted steel.

G. Organic Compost: Compost shall have the following characteristics:

1. pH Range: 5.5-8.0.

1. Moisture Content: 35% - 55%.

2. Particle Size: Pass through one- (1-) inch screen or smaller.

3. Stability: Stable to highly stable, providing nutrients for growth.

4. Maturity/Growth Screening: Demonstrate ability to enhance plant growth.

5. Soluble Salt Concentrations: 2.5 dS (mmhos/cm) or less preferred.

6. Organic Matter Content: 30% – 70%.

7. Suggested Source: A-1 Organic, Eaton, Colorado (970) 454-3492 or an approved equal.

2.03 WATER

A. CONTRACTOR shall provide water for planting during the construction period.

2.04 TREES, SHRUBS, AND GROUND COVERS

A. Quantities: Furnish plants in quantities required to complete the WORK as indicated on the DRAWINGS.

B. Quality: Use plants which are symmetrical and typical of their species; healthy, well-branched, and well-proportioned in respect to height and width; free from disease, injury, insects, and weak roots; and, conforming to the requirements of the ANLA ANSI Z60.1. All plants are subject to inspection.

C. Botanic and Common Names: Nomenclature is in conformance with standard horticultural practice in the area. Trees, shrubs, and herbaceous plant materials designated as native shall NOT be hybrid varieties.

2.05 MATERIALS FOR STAKING, GUYING, AND WRAPPING TREES

A. Tree Stakes: Six- (6-) foot long metal T-Posts.

B. Guying and Staking Wire: Galvanized steel twelve (12) gauge wire.

C. Webbing: Two- (2-) inch nylon webbing or rubberized cloth.

2.06 GRASS SEED

A. Refer to Section 03292, Seeding.

PART 3 EXECUTION

3.01 GENERAL

A. CONTRACTOR shall appoint a competent resident superintendent. The superintendent shall be on site whenever the WORK is in progress. The superintendent shall not be replaced without notice to ARCHITECT. Workers shall be competent in performance of WORK they are assigned.

B. Coordination: Coordinate WORK with other trades to ensure proper sequencing of construction.

C. Planting Time and Completion:

1. Plants shall be planted only when weather and soil conditions permit and in accordance with locally accepted practices, and as approved by ARCHITECT.

2. Trees shall be planted in same growing season in which they were dug.

3.02 PREPARATION

A. Preplanting Observation of Materials:

1. ARCHITECT shall observe and approve plant material before planting. This observation may be either at the site, nursery, or holding area, at the option of ARCHITECT. Materials planted prior to approval are subject to rejection. Observation of materials may be sequenced by major planting areas to accommodate efficient planting operations. Acceptance of plant material at the nursery or holding area does not preclude rejection at the site. All rejected materials shall be removed from the site, replaced, and reinspected before planting.

2. All fertilizers, backfill, seed, mulches, and soil amendments shall be reviewed at the site by ARCHITECT before they are used in planting operations. ARCHITECT shall check invoices to verify specified quantities have been delivered.

B. Site Inspection:

1. CONTRACTOR, Landscape Contractor, and ARCHITECT shall inspect site prior to being accepted by ARCHITECT as complete and acceptable for the Landscape Contractor to proceed.

2. Beginning WORK of this section implies acceptance of existing conditions.

C. Grades: Grades have been established under WORK of another section to within one (1) inch, plus or minus, of required finished grades. Verify that grades are within one (1) inch, plus or minus, of required finished grades. Notify ARCHITECT prior to commencing soil preparation WORK if existing grades are not satisfactory, or assume responsibility for conditions as they exist.

D. Contaminated Soil: Do not perform any soil preparation work in areas where soil is contaminated with cement, plaster, paint or other construction debris. Bring such areas to the attention of ARCHITECT and do not proceed until the contaminated soil is removed and replaced.

E. Dimensions: All scaled dimensions are approximate. Before proceeding with any WORK, carefully check and verify all dimensions and quantities and immediately inform ARCHITECT of any discrepancy between the DRAWINGS and/or specifications and actual conditions.

F. Protection of Existing Features:

1. Protect all existing site development including, but not limited to, existing buildings, equipment, underground utilities, walls, materials, or vegetated areas including, but not limited to, trees, native grasslands, wetlands, or shrublands. Any existing site development damaged by willful or negligent acts of CONTRACTOR or any of CONTRACTOR's employees shall be replaced or repaired at no expense to OWNER and in a manner satisfactory to ARCHITECT before PROJECT acceptance is given.

2. The above provision applies to onsite damage as well as to that which may occur to adjacent properties.

3. Until the PROJECT has been accepted, erect and maintain shoring, barricades, guards, warning signs, and lights as necessary or required for the protection of the public, the WORK, and the workers. To the same ends, provide traffic control and institute site security measures, as needed.

4. CONTRACTOR shall be responsible for adhering to the following tree protection standards during construction:

a. During the construction stage, CONTRACTOR shall not cause, or permit the cleaning of equipment or material, or the storage or disposal or waste material including, but not limited to, paints, solvents, asphalt, concrete, mortar, or any other material harmful to the life of a tree, within the drip line or root zone of each tree, or group of trees.

b. No damaging attachments, wires, signs, permits, or other objects may be fastened by any means to any tree preserved on this PROJECT.

5. Tree areas, shrublands, grasslands, or existing landscape areas within the PROJECT area shall be fenced and excluded from use for vehicle traffic, staging, or parking, unless specifically designated for these purposes on the DRAWINGS or by the ARCHITECT.

3.03 SOIL PREPARATION

A. Weed and Debris Removal: All ground areas to be planted shall be cleaned of all weeds and debris prior to any soil preparation or grading work. Any growing noxious weeds on the site shall be pretreated with approved herbicide prior to grading. Annual or biennial weeds over two (2) feet tall shall be mowed, raked, and removed prior to grading. Weeds and debris shall be disposed of off the site.

B. Moisture Content: Soil shall not be worked when moisture content is so great that excessive compaction occurs, nor when it is so dry that dust will form in the air or clods will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

C. Prior to spreading salvaged topsoil and seeding, thoroughly till or rip to a depth of twelve (12) inches all areas compacted by access, staging, or construction traffic. Till all remaining areas to a depth of six (6) inches. Channel bottom areas are to be ripped to a depth of at least twelve (12) inches on approximately two- (2-) to four- (4-) foot centers. The soils shall be worked until no clods greater than two (2) inches in diameter remain, unless directed otherwise by ARCHITECT. Remove rocks and other objects three (3) inches or greater in any dimension.

D. Soil Conditioning: After soil preparation has been completed and high and low spots graded, add soil amendments as indicated below and rototill, making repeated passes with the cultivator to the depth specified until the amendments have been thoroughly mixed.

1. Organic Compost Soil Amendment shall be applied at a rate of three (3) cubic yards per one-thousand (1,000) square feet or as shown on the DRAWINGS.

2. Organic Compost shall only be applied if required and designated on the DRAWINGS.

3.04 FINE GRADING

A. When weeding, soil preparation, and soil conditioning have been completed and soil has been thoroughly water settled, all planting areas shall be smooth-graded, ready for placement of plant materials and for seeding.

1. Grades: Finish grades shall conform to site grading plans and produce a smooth, even surface without abrupt changes, including the interface with the adjacent undisturbed landscape. Minor adjustments of finish grades shall be made at the direction of ARCHITECT, if required.

2. Drainage: All grades shall provide for natural runoff of water without low spots or pockets. Flow-line grades shall be accurately set and shall be not less than two percent (2%) gradient wherever possible.

3. Shrub Areas: Finished grades shall be one and one-half (1-1/2) inches below top of adjacent pavement, headers, curbs, or wall, unless otherwise indicated on the DRAWINGS.

4. Lawn Areas: Finished grade shall be three-quarters (3/4) inch below top of adjacent pavement, curbs, or headers.

5. Slopes: Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.

B. Inspection of turf/turf bed and grading shall occur before sodding and/or seeding.

3.05 SHRUB AND TREE PLANTING

A. Established Location: ARCHITECT shall approve location of trees and shrubs before any planting occurs.

B. Planting Pits:

1. Dig planting pits two (2) times the size of the soil ball and the depth of the soil ball, unless planting native cottonwoods in non-irrigated areas (see 3 below).

2. Roughen sides of the pit to remove any compacting or glazing.

C. Existing Tree Roots:

1. When the cutting of tree roots is necessary, each final cut shall be made as cleanly as possible for all roots over three (3) inches in diameter using the following method:

a. The line of excavation shall be drawn out and appropriate excavation equipment used to clear the area at least six (6) inches in front of the actual finished excavation line. Roots can then be cut using tools such as axes, stump grinders, or trenchers.

b. Each root over three (3) inches in diameter shall then be cut cleanly back to the final excavation line using a stump grinder operated by an experienced, licensed arborist. A sharp hand or bow saw is acceptable for roots under three (3) inches in diameter. Axes and trenchers do not cut roots cleanly and shall not be used for final root cuts.

2. The ARCHITECT, shall be contacted prior to removal of branches over four (4) inches in diameter. All branches shall be cut with a sharp pruner or saw. All cuts shall be cleanly made back to the next crotch or tree, leaving the bark collar intact at the base of the cut.

D. Backfill Material: Tree and shrub planting pits shall be backfilled with the specified improved planting mix. (Refer to Paragraph 2.02.B.)

E. Planting:

1. On all other tree and shrub planting (other than native plains cottonwoods), excavate planting pit to depth such that the top of the root ball, when planted, shall be at finish grade.

2. For balled and burlapped materials, untie and remove burlap from top third of root ball on balled and burlapped material. Remove wire baskets from top and sides of root ball. Remove twine from around tree trunks.

3. Backfill one-half (1/2) of pit with backfill mixture and water thoroughly before placing any more backfill. Do not work wet soil.

4. Fertilize trees and shrubs with specified fertilizer at the rate recommended by the manufacturer.

5. Backfill the rest of the planting pit with backfill mixture. Water thoroughly on day of planting. Do not work wet soil.

6. Stake or guy all trees.

7. ARCHITECT will check mulch, tree staking, and tree wrapping where appropriate.

3.06 MULCHING

A. Mulch all tree plantings in irrigated landscapes with four (4) inches deep recycled cedar mulch, unless otherwise indicated on the DRAWINGS. Trees or shrubs planted in non-irrigated areas shall be surrounded with a watering dish. Trees or shrubs planted on slopes in non-irrigated areas shall be surrounded with a watering dish

which shall be open on the uphill side to permit accumulation of runoff. The dishes in natural areas shall be mulched with no more than one (1) inch of wood chip mulch and may be seeded along with the adjacent area.

3.07 FIELD QUALITY CONTROL

A. Final Walk-Through:

1. The final walk-through shall be performed at the completion of all planting operations under this CONTRACT.

2. At the time of the final walk-through, the Landscape Contractor shall have planting areas free of debris. Plant basins shall be in good repair. Debris and litter shall be cleaned up, and walkways, curbs, and roads shall be cleared of soil and debris. The inspection shall not occur until these conditions are met.

3. ARCHITECT will identify any deficiencies in the form of a punch list.

4. ARCHITECT will give written notice of final acceptance when WORK has been performed in compliance with the CONTRACT DOCUMENTS.

5. Correct deficiencies within the first ten (10) days of the final walk-through. Correct WORK in accordance with the CONTRACT DOCUMENTS at no cost to OWNER.

6. Final acceptance shall not be given until all deficiencies are corrected. The Landscape Contractor shall maintain site until final acceptance.

3.08 CLEANING

A. Remove from the site excess soil resulting from tree planting and mulching operations.

END OF SECTION

SECTION 03354 – POLISHED CONCRETE FLOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Products and procedures for coloring and bonded abrasive polished concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.

1.2 DEFINITIONS

A. Terminology: As defined by Concrete Polishing Council (CPC) glossary.

B. Polished Concrete: The act of changing a concrete floor surface, with or without surface exposure of aggregate, to achieve a specified level of appearance.

C. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, and polishing a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of appearance as defined by the CPC.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.

B. Installer Qualifications: Data for company, principal personnel, experience, and training specified in PART 1 “Quality Assurance” Article.

C. Maintenance Data: For inclusion in maintenance manual required by Division 01.

1. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
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2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

A. Polisher Qualifications:

1. Experience: Company that has successfully completed five projects similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.

2. Supervision: Maintain a competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman - Level I or higher by CPAA, CPC Craftsman, or equivalent.

3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.

B. Field Mock-up: Before performing work of this Section, provide following field mock-up to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless Architect specifically approves deviations in writing.

1. Define obscure location for testing 10'x10' mockup

2. Perform grinding, honing, and polishing work as scheduled for Project using same personnel as will perform work for Project.

3. Approval is for following aesthetic qualities:

a. Compliance with approved submittals.
b. Compliance with specified aggregate exposure class.
c. Compliance with specified appearance level.
d. Compliance with specified color.

4. Obtain Architect's approval before starting work on Project.

5. Protect and maintain approved field mock-ups during construction in an undisturbed condition as a standard for judging completed work.

C. Pre-Installation of Concrete Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at Project to comply with requirements of applicable Division 01 Sections.

1. Required Attendees:

a. Owner.
b. Architect.
c. Contractor, including supervisor.
d. Concrete producer.
e. Concrete finisher, including supervisor.
f. Concrete polisher, including supervisor.
g. Technical representative of liquid applied product manufacturers.

2. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:

a. Tour field mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.

b. Review Contract Document requirements. c. Review approved submittals and field mock-up. d. Review procedures, including, but not limited to:

1) Applicable Division 03 Section on cast-in-place concrete

a. Specific mix design.
b. Specified curing methods/procedures.
c. Projected 3, 14, and 28 day compressive strength test for finished floor and project phasing.

d. Protection of concrete substrate during construction and prior to polishing process.
e. Project phasing and scheduling for each step of grinding, honing and polishing operations including, but not limited to:
i. Quality of qualified personnel committed to project.
ii. Quality and size of grinders committed to project.
iii. Proper disposal of concrete slurry and/or concrete dust.
f. Details of each step of grinding, honing, and polishing operations.

i. Application of color.
ii. Application of liquid applied products.
iii. Protecting polished concrete floors after polishing work is complete.

3. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.5 FIELD CONDITIONS

A. Damage and Stain Prevention: It is the responsibility of others to prevent damage and staining of concrete surfaces to be polished.

1. Prohibit use of markers, spray paint, and soapstone.
2. Prohibit improper application of liquid membrane film forming curing compounds.
3. Prohibit vehicle parking over concrete surfaces.
4. Prohibit pipe-cutting operations over concrete surfaces.
5. Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
6. Prohibit ferrous metals storage over concrete surfaces.
7. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces.
8. Protect from acids and acidic detergents contacting concrete surfaces.
9. Protect from painting activities over concrete surfaces.

B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 – PRODUCTS

Utilize polished concrete floor system equal to Ameripolish. Utilize the more restrictive of the manufacturer’s specifications or the following:

2.1 LIQUID APPLIED PRODUCTS

A. Liquid Densifier: An aqueous solution of silicon dioxide dissolved in one of the following hydroxides that penetrates into the concrete surface and reacts with the calcium hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete.

1. Sodium Silicate
2. Potassium Silicate
3. Lithium Silicate

4. Alkali solution of Colloidal Silicates or Silica

B. Dye: Non-film forming soluble colorant dissolved in a carrier designed to penetrate and alter coloration of a concrete floor surface without a chemical reaction.

C. Pigmented Micro Stains: Fine pigment particles suspended in water- based silicate solution that penetrates concrete and reacts with calcium hydroxide to lock in color particles.

D. Acid Stain: Reactive solution of one or more metal salts stabilized by acid that produces coloration in a concrete substrate by neutralization of acid followed by precipitation of metal hydroxides or oxides.

2.2 ACCESSORIES

A. Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.

B. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:

1. Epoxy, urethane, polyurea, or polyaspartic resins.
2. Latex or acrylic binders mixed with cement dust from previous grinding steps.
3. Silicate binders mixed with cement dust from previous grinding steps.

2.3 POLISHING EQUIPMENT

A. Field Grinding and Polishing Equipment:

1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.
2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments to meet OSHA requirements.
3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.

B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces the same results, without noticeable differences, as field grinding and polishing equipment.

C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.

D. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.

1. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.

2. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium

matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.

3. Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, and thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.

4. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.

5. Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.

6. Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.

a. Concrete finished floor flatness according to applicable Division 03 Section on cast-in-place concrete.

b. Concrete curing methods according to applicable Division 03 Section on cast-in-place concrete.

c. Concrete compressive strength according to applicable Division 03 Section on cast-in-place concrete.

B. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

C. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Cleaning New Concrete Surfaces:

1. Prepare and clean concrete surfaces.
2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

3.4 COLORING CONCRETE FLOORS

A. Dye or Pigmented Micro Stain Application:

1. Follow manufacturer's recommendation.

3.5 POLISHING CONCRETE FLOORS

A. Perform all polishing procedures to ensure a consistent visual appearance from wall to wall.

B. Initial Grinding:

1. Use grinding equipment with metal or semi-metal bonded tooling.

2. Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.

3. Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.

4. Achieve maximum refinement with each pass before proceeding to finer grit tools.

5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

6. Continue grinding until aggregate surface exposure matches approved field mock-up.

C. Treating Surface Imperfections:

1. Mix patching compound or grout material with dust created by grinding operations, manufacturer's tint, or sand to match color of adjacent concrete surfaces.

2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.

3. Work compound and treatment until color differences between concrete surface and filled surface imperfections, compared to mockup, are not reasonably noticeable when viewed from 20 feet away under lighting conditions that will be present after construction.

D. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to manufacturer's instructions.

E. Grout Grinding:

1. Use grinding equipment and appropriate grit and bond diamond tooling.

2. Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.

3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

F. Honing:

1. Use grinding equipment with hybrid or resin bonded tooling.

2. Hone concrete in one direction starting with 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.

3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

G. Polishing:

1. Use polishing equipment with resin-bonded tooling.

2. Begin polishing in one direction starting with 800 grit tooling.

3. Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of appearance has been achieved.

4. Achieve maximum refinement with each pass before proceeding to finer grit pads.

5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

6. Stain Protection: Uniformly apply and remove excessive liquid according to manufacturer's instructions. Final film thickness should be less than .05 mils after cure.

7. Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.

H. Final Polished Concrete Floor Finish:

1. Aggregate Exposure Class A – Cement Fines: Surface exposure of 85 to 95% cement fines and 5 to 15% fine aggregate based on visual observation of the overall area of the polished floor.

2. Aggregate Exposure Class B – Fine Aggregate: Surface exposure of 85 to 95% fine aggregate and 5 to 15% cement fines and coarse aggregate based on visual observation of the overall area of the polished floor.

3. Aggregate Exposure Class C – Coarse Aggregate: Surface exposure of 80 to 90% coarse aggregate and 10 to 20% cement fines and fine aggregate based on visual observation of the overall area of the polished floor.

4. Appearance Level 1 – Flat (Ground):

a. Procedure: Recommended not less than 4 step process with full refinement of each diamond tool with one application of densifier.

b. Measurement: Determine the Image Clarity Value, %, and the Haze Index:

1) Image Clarity Value, %: An average value of 9 or less measured in accordance with ASTM D5767 prior to the application of sealers.

2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.

3) The minimum number of tests distributed across the polished surface should be three, for areas up to 1000 ft2 and one additional test for each 1000 ft2 or fraction thereof. This applies to both the Image Clarity Value and Haze Index.

5. Appearance Level 2 – Satin (Honed):

a. Procedure: Recommended not less than 4 step process with full refinement of each diamond tool with one application of densifier.

b. Measurement: Determine the Image Clarity Value,%, and the Haze Index:

1) Image Clarity Value, %: An average value of 10 to 39 measured in accordance with ASTM D5767 prior to the application of sealers.

2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.

3) The minimum number of tests distributed across the polished surface should be three, for areas up to 1000 ft2 and one additional test for each 1000 ft2 or fraction thereof. This applies to both the Image Clarity Value and Haze Index.

6. Appearance Level 3 – Polished:

a. Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.

b. Measurement: Determine the Image Clarity Value,%, and the Haze Index
:

1) Image Clarity Value, %: An average value of 40 to 69 measured in accordance with ASTM D5767 prior to the application of sealers.

2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.

3) The minimum number of tests distributed across the polished surface should be three, for areas up to 1000 ft2 and one additional test for each 1000 ft2 or fraction thereof. This applies to both the Image Clarity Value and Haze Index.

7. Appearance Level 4 –Highly Polished:

a. Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.

b. Measurement: Determine the Image Clarity Value, %, and the Haze Index:

1) Image Clarity Value, %: An average value of 70 to 100 measured in accordance with ASTM D5767 prior to the application of sealers.

2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.

3) The minimum number of tests distributed across the polished surface should be three for areas up to 1000 ft2 and one additional test for each 1000 ft2 or fraction thereof. This applies to both the Image Clarity Value and Haze Index.

3.6 PROTECTION A. Protection is the responsibility of others.

END OF SECTION

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of each type of masonry work is indicated on drawings and schedule.

B. Types of masonry work required include:

(1) Reinforced unit masonry
(2) Concrete unit masonry
(3) Brick masonry
(4) Unit masonry reinforcement, anchors and accessories
(5) Mortar and grout for unit masonry

D. Flashings and Joint Sealers related to Unit Masonry are specified in Division 7 Sections.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, (Per Section 721.3, 2006 International Building Code), or by another means, as acceptable to authorities having jurisdiction.

D. Field Constructed Mock-ups: Not required.

1.04 SUBMITTALS

A. Products data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with all specified requirements, including fire performance requirements.

B. Samples for initial selection purposes: Submit samples of the following materials:
(1) Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.

(1) Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.

C. Store cementitious materials off the ground, under cover and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained.

E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS

A. Protection of work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.

F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

G. Protect sills, ledges and projections from droppings of mortar.

H. Cold weather protection:
(1) Do not lay masonry units which are wet or frozen.
(2) Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
(3) Remove masonry damaged by freezing conditions.

I. For clay masonry units with initial rates of absorption (suction) which require them to be settled before laying, comply with the following requirements.
(1) For units with surface temperatures above 32 degrees F (0 degrees C), wet with water heated to above 70 degrees F (21 degrees C).
(2) For units with surface temperatures below 32 degrees F (0 degrees C), wet with water heated to above 130 degrees F (54 degrees C).

J. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum

night temperatures. In heating mortar and grout materials, maintain mixing temperatures selected with 10 degrees F (6 degrees C).

(1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Mortar: Heat mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Follow normal masonry procedures.

(2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperatures of 70 degrees F (21 degrees C) at end of work day.

(3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Mortar: Heating mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Heat both sides of walls under construction using salamanders or other heat sources.
Use windbreaks or enclosures when wind is in excess of 15 mph.

(4) 20 degrees F (-7 degrees C) and below:
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.
Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.

(5) Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).

K. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

(1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

(2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Completely cover masonry with weather-resistive membrane for at least 24 hours .

(3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours grouted masonry.

(4) 20 degrees F (-7 degrees C) and below:
Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric

heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

PART 2 - PRODUCTS

2.01 BRICK MADE FROM CLAY OR SHALE (Utility brick)

A. Comply with referenced standards and other requirements indicated below applicable to each form of brick required.

(1) Size: Provide bricks manufactured to the following actual dimensions:
(a) As indicated on drawings

(2) For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view provide un-cored or un-frogged units with all exposed surfaces finished.

B. Face Brick:

(1) Equal to Cherokee Brick & Tile Co.
Color: M/S Velour Burgundy or pre-approved equal

2.02 CONCRETE MASONRY UNITS

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
(1) Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

B. Concrete block: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification.

(1) Grade N except Grade S may be used above grade in exterior walls with weather protective coatings and in walls not exposed to weather.
(2) Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
(3) Type I, moisture-controlled units.
(a) Cure units by autoclave treatment at a minimum of 350 degrees F (176 degrees C) and a minimum pressure of 125 psi.
(4) Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.
(5) Hollow Load bearing Block: ASTM C90 and as follows:
(a) Weight Classification: Lightweight.
(b) Fire rated units where indicated.

C. Concrete Building Brick: Provide units complying with ASTM C55 and characteristics indicated below for grade, type, size and weight classification.

(1) Grade: Same as indicated for concrete block.
(2) Type: Same as indicated for concrete block.
(3) Size: Standard Modular 2" x 3-5/8" x 7-5/8"
(4) Weight Classification: Lightweight

D. Precast stone:

(1) Dimensions and locations as indicated on plan

2.03 MORTAR AND GROUT MATERIALS

A. Portland cement: ASTM C150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

(1) Mortar color shall be by architect any color, for exposed face brick.

B. Hydrated lime: ASTM C207, Type S.

C. Aggregate for mortar: ASTM C144, except for joints less than 3/8" use aggregate graded with 100% passing the No. 16 sieve.
(1) White Mortar Aggregates: Natural white sand or ground white stone.

D. Aggregate for grout: ASTM C404.

E. Water: Clean and potable.

2.04 ADJUSTABLE MASONRY VENEER ANCHORS

A. GENERAL: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to fit; for attachment over sheathing to metal studs; and with the following structural performance characteristics:
(1) Structural Performance Characteristics: Capable of withstanding a 100 lb load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.

2.05 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
(1) Zinc-coated (galvanized) steel wire: ASTM A82 for uncoated wire and with ASTM A641 for zinc coating of class indicated below:
(a) Class 3 (0.80 oz. per sq. ft. of wire surface).
(b) Application: Use where indicated.

B. Joint reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
(1) Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 2" elsewhere.
(2) For single-wythe and multi-wythe masonry provide type as follows with single pair of side rods:
(a) Truss design with continuous diagonal cross rods spaced not more than 16" o.c.
(3) For multi-wythe masonry with brick veneer or split-face concrete masonry veneer, provide type as follows:

(a) Ladder design with perpendicular cross spaced not more than 16" o.c. and number of side rods as follows: Three (3)
(b) Exterior Walls with Face Brick Veneer over Concrete Block: Equal to DUR-O-WAL D/A 360" LADUR-EYE.

C. Anchor bolts: Where wood blocking and other items are bolted to unit masonry, provide steel bolts with hex nuts and flat washers complying with ASTM A307, Grade A, hot-dip galvanized to comply with ASTM C153, Class C, in sizes and configurations indicated on drawings.

D. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

AA Wire Products Co.
Dur-O-Wall, Inc.
Heckman Building Products, Inc.
Hohmann & Barnard, Inc.
Masonry Reinforcing Corp. of America
National Wire Products Corp.

2.06 CONCEALED FLASHING MATERIALS

A. Sheet metal flashing: Sheet metal flashing is specified in Division 7, "Flashing and Sheet Metal".

B. Membrane flashing: Membrane flashing is specified and furnished under Division 7, "Membrane Flashing". Installation of membrane flashing is specified in this section.

2.07 MASONRY CLEANERS

A. Acidic cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting of systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
(1) Available products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to the following:
(a) "Sure Klean" No. 600 detergent; ProSoCo, Inc.

2.08 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
(1) Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

C. Mortar for unit masonry: Comply with ASTM C270, proportion specification, for types of mortar required, unless otherwise indicated.
(1) Limit cementitious materials in mortar to portland cement-lime.

(2) Use Type M mortar for masonry below grade and in contact with earth and where indicated.
(3) Use Type S mortar for reinforced masonry and where indicated.

D. Grout for unit masonry: Comply with ASTM C476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
(1) Use fine grout in grout spaces less than 2" in horizontal direction unless otherwise indicated.
(2) Use coarse grout in grout spaces 2" or more in least horizontal dimension unless otherwise indicated.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60 for bars No. 3 to No. 18.

B. Pre-molded control joint strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated on Drawings. Indicated as W.C.J. on drawings.
(1) Polyvinyl chloride complying with ASTM D2287, General Purpose Grade, Type PVC 654-4.

C. Anchors for connecting masonry to structural steel framework:
(1) General: Assemblies as detailed and/or noted on Drawings.
(2) Products of Heckmann Building Products, Inc., or equal.
(3) Coordinate required anchor types with spray-on fireproofing system (if applicable).

D. Weep Holes: 5/16" sash-type cotton weep cords (well greased) for use at all weep holes.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Using wetting methods which ensure each clay masonry unit being nearly saturated by dry when laid.

B. Do not wet concrete masonry units.

C. Cleaning reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.

E. Build chases and recesses as shown or required for the work of other trades.

F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full size units without cutting where possible.
(1) Use dry cutting saws to cut concrete masonry units.

3.02 CONSTRUCTION TOLERANCES

A. Variation from plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 3/8" maximum.

B. Variation from level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1-16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 2".

E. Variation in mortar joint thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8" with a maximum thickness limited to 2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.03 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Concrete Unit Masonry Pattern Bond: Lay all interior exposed concrete unit masonry in bond pattern unless stated otherwise. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

D. Face Brick Pattern Bond: Unless specifically shown or noted otherwise on Drawings, lay exposed face brick in RUNNING BOND, with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: Rack back 2 of unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
   (1) Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
   (2) Where the hollow metal frame and masonry work make contact, the joint shall be raked clear of mortar and sealed under Section 7D.
   (3) All cells of the masonry units for the extent of door anchors shall be filled solid with mortar the height of jambs.
   (4) Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
   (5) Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.

F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.05 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

A. Use continuous horizontal joint reinforcement installed I horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
   (1) For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
   (1) Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

D. Non-bearing Interior Partitions: Build to a height indicated on Drawings, except where indicated to be built tight to underside of roof deck above.
   (1) Wedge non-bearing partitions against structure above with small pieces of tile, slate or metal. Fill joint with mortar after dead load deflection of structure above approaches final position.

3.06 CAVITY WALLS

A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

B. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.

C. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c. unless otherwise indicated.

3.07 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Space continuous horizontal reinforcement as follows:
   (1) For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code, but not more than 16" o.c. vertically.
   (2) For single-wythe walls, space reinforcement at 16" o.c. vertically unless otherwise indicated.

F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
   (1) In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.08 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.

(1) Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.09 CONTROL AND EXPANSION JOINT

A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in as the masonry work progresses.

B. Build-in nonmetallic joint fillers where indicated on Drawings.

3.10 LINTELS

A. Install steel lintels where indicated. See Architectural and Structural Drawings.

B. Provide masonry lintels where shown and wherever openings of more than 1'0" for brick size units and 2'0" for block size units are shown without structural steel or other supporting lintels. Provide pre-cast or formed-in-place masonry lintels. Cure pre-cast lintels before handling and installation. Temporarily support formed-in-place lintels.
(1) For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout. See Architectural and Structural drawings.

C. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

3.11 FLASHING OF MASONRY WORK

A. General: Provide concealed flashing in masonry work at or above shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4" and through the inner wythe to within 5/8" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

C. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.

D. Provide specified weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

3.12 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Pointing up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

(1) Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
(2) Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
(3) Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
(4) Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
    (a) Acidic Cleaner; apply in compliance with directions of cleaner manufacturer.
(5) Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

D. Protection: Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

END OF SECTION 04200

SECTION 05500 - MISCELLANEOUS METALS

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Extent of work is indicated on Drawings.

B. This section includes the following miscellaneous metals:

(1) Miscellaneous framing and supports.
(2) Rough hardware.

1.03 SUBMITTALS

A. General: Submit the following in accordance with conditions of contract and Division 1 Specification sections.

B. Product Data and Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other section.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

B. Quality welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code-Steel," D1.3 "Structural Welding Code-Sheet Steel", and D1.2 "Structural Welding Code-Aluminum".

(1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

A. Field measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.

1.06 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.

(1) Comply with Railing Load Requirements of 2006 International Building Code.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal surfaces, general: For metal fabrications exposed to view upon completion of the work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel plates, shapes, and bars: ASTM A 36.

C. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade as follows:

(1) Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:

(a) Grade A, unless otherwise indicated or required by design loading.

(2) Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:

(a) Grade 30, unless otherwise indicated or required by design loading.

D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
(1) Cold-Rolled Steel Sheet: ASTM A 366.
(2) Hot-Rolled Steel Sheet: ASTM A 569.

E. Galvanized Steel Sheet: Quality as follows:
(1) Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.

F. Cold-Formed Steel Tubing: ASTM A 500.
(1) For exterior installations, where indicated on Drawings, provide tubing with hot-dip galvanized coating per ASTM A 53.

G. Gray Iron Castings: ASTM A 48, Class 30.

H. Malleable Iron Castings: ASTM A 47, grade 32510.

I. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported items, unless otherwise indicated.

J. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 26 Gage.

K. Concrete Inserts: Threaded or wedge, type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

L. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

A. Non-shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.

B. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

(1) Non-shrink Metallic Grouts:
"Hi Mod Grout"; Euclid Chemical Co.
"Embeco 885 and 636"; Master Builders
"Ferrolith G Redi-Mix and G-NC"; Sonneborn Building Products Div.,

(2) Non-shrink Nonmetallic Grouts:
"Euco N-S Grout"; Euclid Chemical Co.
"Masterflow 713"; Master Builders
"Sonogrout"; Sonneborn Building Products Div.,

(3) Erosion-Resistant Anchoring Cement
"Super Por-Rok"; Minwas Construction Products Division

2.03 FASTENERS AND MISCELLANEOUS MATERIALS:

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.

C. Lag Bolts: Square head type, FS FF-B-561.

D. Machine Screws: Cadmium plated steel, FS FF-S-92.

E. Wood Screws: Flat head carbon steel, FS FF-S-111.

F. Plain Washers: Round, carbon steel, FS FF-W-92.

G. Drilled-in Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, non-drilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

J. Solder: For use with stainless steel, provide 60-40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.

K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

L. Wire Mesh: Provide McNichols square mesh, item 3803260041 or equal at rear openings in dugouts and 3793920041 at dugout doors. Utilize U-Edging 4080145010 at steel and 4071245010 at aluminum to finish perimeter. Fasten either side with 1x1.5 angle brackets at openings and/or as required by design.

2.04 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

C. Zinc Chromate Primer: FS TT-P-645.

2.05 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the maximum change (range) in ambient temperature in the design, fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints, and over stressing of welds and fasteners.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with AWS recommendations and the following:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.
(4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.09 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware, hangers, and similar items.

2.11 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.2.12 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
(1) ASTM A 153 for galvanizing iron and steel hardware.
(2) ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

(1) Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
(2) Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirement of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instruction, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set Sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used I correcting welding work, and the following:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.
(4) At exposed connections, finish exposed welds and surfaces smooth and blend so that no roughness shows after finishing and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum or stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.05 ADJUSTING AND CLEANING

A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting", of these specifications.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood backing panels.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

D. APA: American Plywood Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: Treat according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood framing and furring attached directly to the interior of exterior masonry or concrete walls.

2.3 DIMENSIONAL LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. All structural wood framing: No. 2 grade and the following species:

1. Southern yellow pine; SPIB.

C. All other non-structural wood framing: No. 2 grade and the following species:

1. Spruce, Pine or Fir at Contractor's option.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Mechanical equipment bases, frames and support curbs.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content and the following species:

1. Mixed southern pine; SPIB.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood siding at interior spaces, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 MISCELLANEOUS MATERIALS

H. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Building Paper: Asphalt-saturated felt, non-perforated, ASTM D226.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports, unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

H. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 INSTALLATION OF PLYWOOD

A. Comply with recommendations of American Plywood Association (APA).

3.5 PROTECTION

B. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

SECTION 06400 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION

A. The extent of the Millwork is shown on the drawings and finish schedules, but will be further refined upon selection of the furniture package. and is hereby defined as architectural woodwork which includes cabinets, counters, shelving, plastic laminates, and wood trim.

B. Furnishing and installation of hardware for Millwork is included in this section.

C. Rough carpentry is specified in Section 06100.

1.03 QUALITY ASSURANCE

A. Subcontract the fabrication of millwork to a firm which has successfully produced millwork similar to the quality specified and in the quantity shown.

B. The "Quality Standards" of the Woodwork Institute of California shall apply, and by reference are hereby made a part of this Specification. Any reference to Premium, Custom, or Economy in this Specification shall be as defined in the latest edition of the WIC "Quality Standards".

1.04 SUBMITTALS

A. Submit shop drawings to the Architect for review prior to fabrication of millwork, showing dimensioned plans and elevations, large-scale details, anchors, and other components.

B. Samples: Submit the following samples:

1. Plastic Laminate: 8" x 10" for each type, color, pattern, and surface finish indicated. (If required by the Design Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect millwork items during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

B. Do not deliver millwork items until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate millwork have been completed in installation areas. If, due to unforeseen circumstances, millwork must be stored in other than installation areas, store only in areas meeting requirements and specified for installation areas.

1.06 PROJECT CONDITIONS

A. Conditioning: Millwork manufacturer and installer shall advise Contractor of temperature and humidity requirements for millwork installation and storage areas. Do not install millwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed millwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require millwork manufacturer to establish optimum moisture content, and required temperature and humidity conditions.

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers require prior approval.

2.02 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication, and for relative humidity conditions in the installation areas.

B. Fabricate millwork to dimensions, profiles, and details indicated, with openings and mortises precut, where possible, to receive hardware and other items and work. Ease edges to a 1/16" radius for corners of cabinets and edges of solid wood (lumber) members less than 1" in nominal thickness, 1/8" radius for edges of rails and similar members over 1" in nominal thickness.

C. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Pre-Cut Openings: Fabricate millwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and where located in counter tops and similar exposures, seal edges of cutouts with a water-resistant coating.

E. Measurements: Before proceeding with fabrication of millwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawings details as required for accurate fit.

2.03 WOOD TRIM

A. Quality Standards: WIC Sections 7 or 10.

B. Grade: Custom Grade.

C. Species of Wood: [SEP]Interior: Colored, Transparent Finish – Clear Maple exact sizes and profiles will be determined once it is all coordinated with the furniture package.

. 2.04 ARCHITECTURAL CABINETS, LAMINATE CLAD

A. Quality Standard: Comply with WIC Section 15 "Plastic Covered Casework.

B. Laminate Clad Cabinets: Comply with the following requirements.

1. Grade: Custom

2. Type of Cabinet Construction: Flush overlay.

3. Laminate Cladding: High-pressure, decorative laminate complying with NEMA LD 3, and as follows:

a. Colors and Patterns: As indicated on Drawings or as selected by Architect.

b. Finish: Full range of all Formica or Wilsonart

4. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade:

a. Horizontal Surfaces, Other Than Tops: GP-50 (0.050" nominal thickness).

b. Postformed Surfaces: PF-42 (0.042" nominal thickness).

c. Vertical Surfaces: GP-28 (0.028" nominal thickness).

d. Edges: GP-28 (0.028" nominal thickness).

5. Semi-Exposed Surfaces: Provide surface materials indicated below: Manufacturers standard low pressure laminate.

C. Provide dust panels of 1/4" plywood or tempered hardboard above compartments and drawers, except where located directly under tops.

D. Hardware: To be selected and coordinated with the furniture package.

E. Finish Hardware (as applicable to drawings)

2. Hinges: Blum Clip or equal (European type), 270 degree swing.

3. Pulls: Base the budget on Baldwin 4674 4" ‘D’ pull with brushed aluminum finish

4. Catches: Friction Amrock CM 9823B.

5. Sliding door track: Epco No. 821 bottom track, No. 2234 upper track.

6. Drawer slides: Knape & Vogt No. 476.

7. File drawer slides: Grant No. 329.

8. File drawer follower rods: Knape & Vogt No. 476.

9. Adjustable shelf clips: Knape & Vogt No. 256.

10. Casters: Faultless, G-429 Series, 270 pound rating.

11. Locks: National Lock No. C-8055-A.

12. Screws: Reed and Prince square drive screws. Standard wood screws and sheet metal screws are not acceptable.

13. Provide countertop supports and brackets as required to support countertops without base cabinets. Brackets shall be sized and installed to support not less than 400lb load without any countertop deflection in any direction.

2.05 WOOD SHELVES

A. Located where shown on plan. Provide five (5), 16” continuous laminate faced wood shelves on adjustable vertical standards. Maximum span between vertical supports is 4’-0”.

2.06 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition millwork to average prevailing humidity conditions in installation areas prior to installing.

B. Prior to installation of millwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

A. Install millwork plumb, level, true, and straight, with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

B. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor millwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping, and blocking with countersunk, concealed fasteners

and blind nailing as required for a complete installation.

3.03 INSTALLATION OF CABINET WORK

A. Install cabinet work straight, level, plumb, and securely anchored in place. Scribe and closely fit to adjacent work. Conceal all fastenings. Install all counter tops with tight fitting connections to walls and cabinets.

3.04 INSTALLATION OF WOOD TRIM

A. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Cope at returns, miter at corners, and comply with referenced Quality Standards for joinery. Use scarf joints for end-to-end joints.

3.05 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Repair damaged and defective millwork where possible, to eliminate defects functionally and visually; where not possible to repair, replace millwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware so that doors and drawers fit openings properly, are accurately aligned, and operate smoothly.

C. Clean millwork on exposed and semi-exposed surfaces.

D. Refer to Division 9 Sections for final finishing of installed millwork.

E. Provide final protection, and maintain conditions in a manner acceptable to fabricator and installer, which ensures millwork being without damage or deterioration at time of substantial completion.

END OF SECTION 06400

SECTION 07210 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket.
2. Mineral-wool blanket.
3. Loose-fill insulation.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
3. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

A. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens CorningCertainTeed Corporation.
b. Guardian Building Products, Inc.
c. Johns Manville; a Berkshire Hathaway company.
d. Equal

C. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens CorningCertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Equal

D. Glass-Fiber Blanket, Foil-Scrim-Kraft (FSK) Faced ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens CorningCertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Equal

E. Glass-Fiber Blanket, Kraft Faced : ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens Corning

b. CertainTeed Corporation.
c. Guardian Building Products, Inc.
d. Johns Manville; a Berkshire Hathaway company.
e. Knauf Insulation.
f. Equal

F. Glass-Fiber Blanket, Foil Faced: ASTM C 665, Type III (reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens Corning

b. CertainTeed Corporation.
c. Guardian Building Products, Inc.
d. Johns Manville; a Berkshire Hathaway company.
e. Knauf Insulation.
f. Equal

G. Glass-Fiber Blanket, Faced: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

a. Owens Corning

b. CertainTeed Corporation.
c. Guardian Building Products, Inc.

d. Johns Manville; a Berkshire Hathaway company.
e. Knauf Insulation.
f. Equal

2.2 MINERAL-WOOL BLANKETS

A. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Industrial Insulation Group, LLC (IIG-LLC).
b. Roxul Inc.
c. Thermafiber, Inc.; an Owens Corning company.
d. Equal

C. Mineral-Wool Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thermafiber, Inc.; an Owens Corning company.
b. Equal

2.3 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.
c. Equal

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Gemco.
b. Equal

2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.
c. Equal

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Crawl spaces.
b. Ceiling plenums.
c. Attic spaces.
d. Equal

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of [**1 inch (25 mm)**] [**2 inches (50 mm)**] [**3 inches (76 mm)**] between face of insulation and substrate to which anchor is attached.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Gemco.
b. Equal

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.

c. Equal

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Adhesives shall have a VOC content of **70** g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.

D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of **36 inches** below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of **36 inches** from exterior walls.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), and the insulation does not completely fill the cavity, support unfaced blankets mechanically and support faced blankets either mechanically or by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:

    a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07411 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.
2. Gutters and downspouts.
3. Fascia, roof flashings and trim.

B. Related Sections:

1. Division 05 Section "Steel Decking" for steel roof deck supporting metal roof panels.
2. Division 07 Section "Sheet Metal Flashing and Trim" for field-formed fasciae, copings, flashings, and other sheet metal work not part of metal roof panel assemblies.

1.3 DEFINITIONS

A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 1680 at the following test-pressure difference:

1. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft. (75 Pa).
2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. (720 Pa) and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

C. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12.0 lbf/sq. ft. (575 Pa).

2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. (720 Pa) and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

E. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: SH.

F. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.

2. Snow Loads: 30 lbf/sq. ft. (1436 Pa).
3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.

G. Steel Sheet Performance: Steel conforms to ASTM A792.

1. Yield Strength: 50 ksi (345 Mpa) minimum yield for 16” wide panels.
2. Tensile Strength: 55-70 ksi (379-483 MPa).
3. Total Elongation: 18-36%.
4. Hardness: 50-65 HRB.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Shop drawing must be project specific for metal roof panel assembly indicated. Include roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installers of the items involved:

    a. Roof panels and attachments.
    b. Purlins and rafters.
    c. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.

2. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):

    a. Flashing and trim.
    b. Gutters & downspouts.
    c. Penetration flashings.
    d. Roof curbs.

3. Shop drawings must comply with performance requirements and design criteria; approved and signed by the Metal Panel Manufacturer.

C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.

1. Provide manufacturer's color chart for color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Roof and Soffit Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch long Samples for each type of accessory.

E. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.
2. Submit signed approval of project drawings and specifications meeting manufacturer's requirements for specified manufacturer's warranties.
3. Submit evidence of Installer/contractor meeting requirements for specified warranties.

F. Qualification Data: Each pre-qualified manufacturer shall provide complete and current data for specified roof system as follows:

1. For qualified Installer approved by the roof panel manufacturer.
2. Thermal cycle testing of metal roof panels and panel clips.
3. Uniform ultimate wind uplift load capacity test for metal roof panels as specified.
4. Ultimate pull-out capacity for panel clips, tested as specified.
5. UL 90 Classification test data as specified.
6. Static air infiltration resistance test data as specified.
7. Water penetration test data as specified.
8. Documentation that fasteners will provide approved UL-90 resistance or design wind uplift loads.

G. Material Certificates: For thermal insulation, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

I. Maintenance Data: For metal roof panels to include in maintenance manuals.

J. Warranties: Samples of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of sheet metal roofing:

1. Preformed metal roof system installer must be an Authorized Installer or Licensee, acceptable to roof system manufacturer. Manufacturer will determine **initial** acceptability of installer's qualifications for specified roof systems. The Architect/Owner will determine **final** acceptability of installer for the specified roof system.
2. Installer's primary business must be the installation of roofing systems.
3. Installer must have minimum of five (5) years experience installing preformed metal roofing systems.
4. Installer must have successfully completed a minimum of five (5) significant installations of preformed metal roofing systems, including installation of long preformed panels. Submit complete description of each previous project, including name and phone numbers of representatives of the Owner, Architect, Manufacturer and Contractor.
5. Submit name and resume' of installer's proposed job superintendent, including list of similar projects completed by superintendent. Installer must maintain a full-time job superintendent on site during all phases of work.
6. Installer must execute 100% of metal roof system installation with installer's own employees. Second and third tier subcontractors for the installation of work in this Section will not be permitted.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing and FMG approval specializing in Roof Architectural Sheet Metal Products with ten (10) years minimum experience. Being listed as a pre-qualified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified for specific profile proposed. Manufacturer must comply with the following criteria:

1. Provide certification of Installer/contractor.
2. Provide signed approval of project drawings and specifications.
3. Attendance at the pre-roofing conference.
4. At least three (3) interim job site technical inspections by the manufacturer's technical field representative and submit a copy of the inspection reports to the Installer, General Contractor and Architect, within three (3) days following each inspection. Visits or "inspections" by manufacturer’s sales representatives do not count towards this criteria.
5. Upon completion of the roofing system installation, a final inspection by the manufacturer’s technical field representative and submission of a “Punch-list” of any required work to be completed by the Installer.

C. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

D. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
2. Combustion Characteristics: ASTM E 136.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof eave, including fascia, and soffit as shown on Drawings; approximately two panels wide by full eave width, including insulation, underlayment, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

F. Preinstallation Conference: Conduct conference at Project site.
Note: Attendance by the metal roof panel manufacturer is mandatory.

1. Meet with Owner, Architect, Alabama Building Commission Inspector, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's technical representative, deck, (purlin and rafter**)** Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
4. Examine deck substrate, (purlin and rafter) conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of deck (purlins and rafters) during and after roofing.
6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for metal roof panel assembly during and after installation.
9. Review roof observation and repair procedures after metal roof panel installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks**,** (purlins and rafters**),** parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. General: Required Manufacturers' warranties must be dated within thirty (30) days of the date of Substantial Completion. Manufacturers' warranties cannot be prorated.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
d. Deterioration of metal finishes beyond normal weathering, including nonuniformity of color or finish.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Loose parts.
b. Wrinkling or buckling.
c. Failure to remain weathertight, including water leakage.
d. Galvanic action between sheet metal roofing and dissimilar materials.

2. **Warranty shall include all roof panels, roof curbs, and flashings which are an integral part of the roofing system.**
3. Warranty Period: Twenty (20) years from date of Substantial Completion.

D. Special Installer's Warranty: Roofing Installer's warranty, signed by Roofing Installer, in which Roofing Installer agrees to repair or replace components of preformed sheet metal roofing that fail in materials or workmanship within specified warranty period.

1. **Warranty shall include all roof panels, pipe flashings, sealant, roof curbs, gutters and flashings which are an integral part of the roofing system.**
2. Warranty Period: Five (5) years from date of Substantial Completion.

E. State of Alabama General Contractor's Roofing Guarantee:

1. Provide a FIVE (5) year State of Alabama General Contractor's Roofing Guarantee.

PART 2 - PRODUCTS

2.1 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed (SSR) standing seam metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Mechanically Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs (striations) symmetrically spaced between ribs and having factory-applied seam sealant; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Panels shall be designed as true standing seam shape, requiring no trapezoidal foam closures, plugs or fillers at eaves.
2. Standing seams shall mechanically interlock with concealed anchorage. Integral snap seams are not acceptable.
3. Seams shall allow anchorage to resist negative loading and allow expansion and contraction of panels due to thermal changes.
4. Standing seam must prevent water capillary action, or otherwise prevent water infiltration.
5. Standing seams must contain a factory applied sealant to prevent siphoning of moisture through the side joint seam (extruded vinyl weather seal not allowable with intermittent clip system).
6. Panels shall be factory preformed in continuous lengths as required. No horizontal endlap joints shall be permitted in roof panel lengths. Panels shall be full length from peak to eave as indicated. Transverse or end lap seams will not be permitted.
7. Panel system attachment shall be with expansion type clips with concealed fasteners.
8. Exposed fasteners in roofing pans will not be permitted.
9. Manufacturer shall examine panels as they are formed to ensure panels are being formed within job requirements and acceptable tolerances.

C. Manufacturers are subject to compliance with project requirements. Manufacturers offering products that may be incorporated into the Work of this project shall agree in writing of acceptance of roofing assembly as specified and detailed.

D. Material:

1. Sheet Thickness: 24-gauge nominal thickness.
2. Yield Strength: 50 ksi (345 Mpa) minimum yield for 16” wide panels.
3. Exterior Finish: Kynar 500 / Hylar 5000.
4. Color: As selected by Architect from manufacturer's full range.

E. Panel Clips: Expansion type two-piece assembly; UL 90 rated; base fabricated from #16 MSG minimum gauge steel 0.0625-inch thick; top fabricated from #22 minimum gauge steel 0.0336, designed to withstand negative-load requirements.

1. Bearing Plates: Fabricated in 5 inch by 6 inch (5” x 6”) size from 16-gauge steel thickness unless otherwise indicated.

F. Joint Type: Single folded.

G. Panel Coverage: 16 inches.

H. Panel Height: 2.0 inches.

I. Panel Sealants:

1. Seam Sealant: Factory applied seam sealant.
2. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2- inch wide and 1/8- inch thick.
3. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
4. Expansion-Joint Sealant: For hooked-type expansion joints, which must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene sealant.
5. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 FIELD-INSTALLED THERMAL INSULATION

A. Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1 or 2 felt or glass-fiber mat, Grade 3, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core. **Minimum thickness: 1 inch**.

1. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

2.4 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: 16-gauge
2. Depth: 7/8 inch.

C. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.

1. Nominal Thickness: 16-gauge.
2. Depth: 3/4- inch.
3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 20-gauge.

D. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous metal framing members to substrates.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal roofing by means of factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: Exposed rivets shall be self-plugging type minimum 3/16-inch diameter 300 series alloy high-strength stainless-steel with stainless-steel stems.
4. Concealed fasteners shall be pancake head, size, type, and spacing per manufacturer's recommendation, to attach expansion clips spaced per requirements.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.

B. Flashing and Trim: Formed from same material as roof panels, pre-painted with coil coating, minimum 24-gauge thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners,

bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

1. Refer to Division 7 ″Sheet Metal Flashing & Trim″ for field-formed fasciae, copings, flashings**,** and other sheet metal work not part of this section.

C. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base, with stainless-steel clamp.

1. Install rain collar, formed from same material as roof panels pre-painted with coil coating, minimum 24-gauge thick, over completed assembly as indicated.

2.7 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Form and fabricate valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for leakproof construction.

B. Provide panel profile, including major ribs and striations for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed seam sealant that provide a weathertight seal and minimize movements within panel assembly.

D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant (concealed within joints).

E. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

G. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices from same type material as accessory being anchored or from compatible, noncorrosive metal.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than 20-gauge.

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

B. Examine metal roof decking to verify that lapped sections are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

C. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install flashings and other sheet metal to comply with requirements specified.

B. Install fascia, gutter and edge trim to comply with requirements specified.

C. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

D. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

1. Soffit Framing: Clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

A. Provide metal roof panels of full length from eave to ridge.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.

1. Point of Fixity: Fasten each panel along a single line of fixing located at high side roof-to-wall, ridge, and hips.
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Install metal roof panels as follows:

1. Commence metal roof panel installation in presence of factory-authorized technical representative.
2. Field cutting of sheet metal roofing by torch or abrasive cutting tools is not permitted.
3. Install panels and required system components at all roof area locations as indicated.
4. Transverse or end lap seams will not be permitted.
5. Exposed fasteners in roofing pans will not be permitted.
6. Verify with manufacturer locations of fixed and expansion connections.
7. Provide metal closures at rake edges and each side of ridge and hip caps.
8. Flash and seal sheet metal roofing with weather closures at eaves, rakes, and at perimeter of all openings.
9. Install ridge and hip caps as sheet metal roofing work proceeds.
10. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.
11. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
12. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
13. Remove and replace any panels or components which are damaged.

D. Fasteners:

1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
2. Fasten concealed anchorage with fasteners as recommended by manufacturer and at spacing as required to meet wind uplift requirements.

E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

1. Panel system attachment shall be with expansion type clips with concealed fasteners.
2. Anchor to resist negative loading and allow expansion and contraction of panels due to thermal changes.

F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, wood, ferrous metal, or cementitious construction protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

3.4 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer to meet project requirements.

1. Install fasciae and gutters as indicated prior to beginning roof panel installation.
2. Install starter cleat and edge trim prior installing roof panels.
3. Hook pan at eave edge to continuous starter cleat.
4. Provide factory preformed roof panels in continuous, eave to ridge lengths. Take care to properly handle long panels (support at max. 15' intervals).
5. Remove protective strippable film immediately prior to installation of roof panels.
6. Install and clip to hold sheet metal panels in position. Attach each clip with two fasteners to prevent rotation. Space clips per manufacturer's recommendation for wind uplift requirements **but not to exceed 30 inch centers**.

    a. Mechanically attach each clip through bearing plate with manufacturer's recommended fasteners of length sufficient to extend through insulation board and penetrate steel deck a minimum of 3/4-inch.

7. Install panels to clips per manufacturer's details.
8. Provide factory applied sealant in all standing seams.
9. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
10. Erect metal roofing with lines, planes, rises and angles sharp and true, and plane surfaces free from objectionable wave, warp, dents, buckle or other physical defects with minimum oil canning.
11. Install roof panels parallel and perpendicular to building lines; on module with adjoining standing seams fitted tightly together.
12. Coordinate plumbing vent pipe penetrations with plumbing contractor to prevent pipe penetration in standing seams. Provide open space in panels for thermal expansion at pipe penetrations.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24- inches corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Roof Curbs: Install curbs at locations indicated on Drawings in accordance with roof panel manufacturer's written instructions. Install flashing in accordance with Drawing details.

D. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer. Provide rain bonnet/collar as indicated.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4-inch in 20 feet and 3/8-inch in forty feet (40'-0") or more, on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07411

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sheet metal flashing and trim:
   1. Formed roof flashing and trim.
   2. Gutters and downspouts

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

   1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft. (1.48 to 2.15 kPa): 90-lbf/sq. ft. (4.31-kPa) perimeter uplift force, 120-lbf/sq. ft. (5.74-kPa) corner uplift force, and 45-lbf/sq. ft. (2.15-kPa) outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

   1. Identify material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.

1. Include Manufacturer’s standard color chart for color selection.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual, 6th Edition." Any clarifications will be in accordance with this standard. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Pre-roofing Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Meet with Owner, Architect, Alabama Building Commission Inspector, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTIES

A. Furnish Manufacturer's Standard Twenty (20) Year Warranty Finish warranty.

B. All sheet metal flashings, trim and components shall be included in the State of Alabama General Contractor’s Roofing Guarantee for a period of five (5) years.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum-Zinc Alloy-coated Steel Sheet: Produced according to ASTM Specification A792/A792M-97a "Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process."; Structural quality, AZ50 or 0.50 oz/sq. ft. (150 g/sq. m.).

1. Sheet Thickness: 24-gauge nominal thickness.
2. Exterior Finish: Kynar 500 / Hylar 5000.
3. Color: As selected by Architect from manufacturer's full range.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 2D dull, cold rolled.
2. Thickness: 0.015 unless otherwise indicated.

2.2 UNDERLAYMENT MATERIALS

A. Polyvinyl chloride (PVC) Sheet: .020″ thick polyvinyl chloride sheet complying with ASTM D 822 as manufactured by Nervastral.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Solder for Galvanized Steel: ASTM B 32, ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from galvanized steel.

1. Thickness: As indicated; minimum 20-gauge

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections.

1. Gutter Straps: fabricated from 16-gauge galvanized steel, 1-1/4- inch width, spaced at 30 inch centers.
2. Gutter Accessories: Fabricate expansion-joint covers, outlet tubes, ends and other gutter accessories from same metal as gutters.
3. Gutter Style: “K” unless otherwise indicated.
4. Expansion Joints: “Built in”.
5. Fabricate gutters and accessories from the following material:

a. Aluminum-Zinc Alloy-coated Steel: 24-gauge thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Hangers: Hemmed edges 1-1/4- inch width.
2. Fabricate downspouts from the following material:

    a. Aluminum-Zinc Alloy-coated Steel: 24-gauge thick.

2.6 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. General: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.

B. Flashing and Trim: Formed from same material as roof panels, pre-painted with coil coating, minimum 24-gauge thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Eave, Rake**,** Ridge, and Hip Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 24-gauge thick.

D. Counterflashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 24-gauge thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:

1. Stainless Steel: 0.015 inch thick unless otherwise indicated.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 24-gauge thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:

1. Aluminum-Zinc Alloy-coated Steel: 24-gauge thick.

2.9 AUXILIARY COMPONENTS

a. Cast iron downspout boots

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment between all sheet metal fabrications and any wood, masonry, EIFS substrates.

B. Polyethylene Sheet: Install polyethylene sheet under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. Clarifications: Any clarifications will the minimum standards set forth by Sheet Metal & Air Conditioning Contractors' National Association, Inc. (SMACNA) and National Roofing Contractors Association (NRCA).

B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Install continuous cleats spaced not more than one (1) inch apart. Anchor each cleat with fasteners through the vertical leg face at twelve (12) inch centers.

4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a slip sheet of polyvinyl chloride (PVC) underlayment.
2. Bed flanges in approved sealant where required for waterproof performance.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

E. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4- inches for nails and not less than 3/4 inch for wood screws.

1. Galvanized or Aluminum-Zinc Alloy-coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.
3. Copper: Use copper or stainless-steel fasteners.
4. Stainless Steel: Use stainless-steel fasteners.

F. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

1. Do not solder Aluminum-Zinc Alloy-coated Steel sheet.
2. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, NRCA’s “Roofing and Waterproofing Manual” and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone but not less that 4 inch centers in staggered pattern.

1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 12 inch centers through the vertical leg face.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Install roof penetration flashings as indicated and in compliance with the primary roofing manufacturer’s written instructions.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

C. Saw-Cut Reglets: Saw-cut reglet joints a minimum of one (1”) inch deep by one quarter (1/4”) inch wide into masonry substrate/wall at locations indicated.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07620

SECTION 07920 – JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Extent of joint sealer (denoted “sealant” or “caulking” on Drawings) is indicated on Drawings.

B. This Section includes joint sealers for the following locations:

(1) All locations as indicated or as required to provide watertight or aesthetic joints.

C. Sealants for Glazing Purposes are specified in a Division 8 Section.

D. Materials shall be delivered to the job site in new unbroken containers clearly labeled as to contents. Store at normal room temperature.

E. Color cards of current available colors shall be submitted to Architect for selection of color.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sealant shall be equal to Sonneborn NP-1", 1-part polyurethane, U.S. Government Spec. TT-S-00230, Type II, Class A. (Exterior locations).

2.02 Joint backing shall be as recommended by sealant manufacturer.

PART 3 – EXECUTION

3.01 APPLICATION

A. Examine all joints to determine their acceptability for caulking and report discrepancies to the General Contractor.

B. Clean all joints of foreign matter or loose particles; use compressed air as necessary. Insure that surfaces are dry.

C. Joints up to 2" wide shall be 1/4"-3/8" deep. Joints over 2" wide shall have depth required. Force in sealant to fill entire joint and tool smooth. Use solvent as recommended by the sealant manufacturer for tooling.

D. At completion of joint sealers, clean off all excess material from adjoining surfaces. Correct any damage caused by this work and leave work in watertight and neat condition.

END OF SECTION 07920

SECTION 08110 – HOLLOW METAL DOORS & FRAMES

PART 1 GENERAL

1.01 WORK under this section comprises of furnishing and installing hollow metal frames for doors, windows and hollow metal doors and panels.

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, General and Supplementary Conditions and Division 1 specifications sections apply to this section.

1.03 RELATED WORK, specified elsewhere that should be examined for its effect upon this section.

A. Section 08210 Wood Doors

B. Section 08800 Glass and Glazing

C. Section 09900 Painting & Staining

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. UL 10B -93, Fire Tests of Door Assemblies.

B. ASTM-A366-95A - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

C. ASTM-A568-95 -Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

D. ASTM-A 569-91A - Specification for Steel, Carbon, (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

E. ASTM-A924-95 - General Requirements for Steel Sheet, Metallic coated by the Hot-Dip Process.

F. ASTM-A620- Specifications for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold Rolled (for embossed panels).

G. ANSI A250.8-1998/SDI100 - Recommended specifications for standard steel doors and frames.

H. SDI-105-92 - Recommended Erection Instructions for Steel Frames.

I. ANSI/SDI A250.6 - 1997 - Hardware on Steel Doors (reinforcement-application).

J. NFPA-80-1999 - Standard for Fire Doors and Windows.

K. NFPA-101-2006 - Life Safety Code.

L. ANSI-A250.4-1994 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.

M. ANSI-A224.1-1990 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.

N. ADA, The Americans with Disabilities Act - Title III - Public Accommodations

O. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities

P. U. L. - Underwriter's Laboratories

Q. WHI - Warnock Hersey International, Division of Inchcape Testing Services

R. State and Local codes including Authority Having Jurisdiction

S. N.F.P.A. 105-93 Smoke and draft control assemblies.

T. U.L. - 1784-90 Air leakage test of door assemblies.

U. ASTM E283- 91 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

V. IBC- 2003 and UL10c

1.05 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations and sections, materials, gages and finishes,fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.

B. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.

C. Submit samples as necessary.

1.06 QUALITY ASSURANCE

A. Certification of label construction: For components exceeding Underwriters Laboratories, Inc. (UL)- furnish inspection certificate stating that component construction conforms to UL rating requirements only if Architect is aware of such a limitation and has allowed the non-labeled unit.

B. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the total door and frame openings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.

B. Inspect doors and frames upon delivery for damage.Minor damages may be repaired provided refinished items are equal in all respects to new work and accepted by the Architect. Otherwise remove and replace damaged items.

C. Store doors and frames at the building site in a dry, secure place.

1. Place units on minimum 4 inches (101.6) high wood blocking.

2. Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber.

3. If cardboard wrapper/packaging on door becomes wet, remove packaging materials immediately.

4. Provide 1/4 inch (6.3) spaces between stacked doors to promote air circulation.

1.08 SEQUENCING AND SCHEDULING

A. Deliver all doors and frames to the jobsite in a timely manner so not to delay progress of other trades.

B. Issue purchase orders to frame, door and other hardware suppliers early so not to interfere with normal quoted delivery of materials.

1.09 **WARRANTY**

A. Hollow metal doors and frames shall be supplied with a one (1) year warranty against defects in materials and workmanship.

B. Warranty to commence with substantial completion of the job.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (providing the products supplied comply with this specification)

A. STEELCRAFT

B. CURRIES Co.

C. CECO

2.02 MATERIALS

A. Steel requirements, all doors and frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A-366 and A-568 general requirements or galvanealed to 'A-60' minimum coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.

B. Coating Materials, primer, Use manufacturer's standard rust inhibiting primer conforming to ANSI-A-224.1-1990.

C. Core Materials

1. Nonlabeled doors or labeled doors, polystyrene foam core, self-extinguishing, non-toxic in case of fire.

2. Fire labeled doors with temperature rise rating to have a mineral fiber core sufficient to obtain a 250 degree F (121 C) temperature rating.

D. Glass lite frames in doors fabricated of not less than 18 ga.(1.2) galvanized steel with attachment screws allowed only on the non-secure side, not visible when viewing door lite frame face.

2.03 FABRICATION

A. General

1. Fabricate all doors and frames in accordance with ANSI A250.8-1998/SDI-100 except where more stringent requirements are specified.

2. Prepare doors to receive finish hardware per approved schedule. Include all thru-bolting holes as required per hardware template. not include unnecessary cutouts in door faces not required hardware template.

3. Supply only doors and frames manufactured by one (1) of the acceptable manufacturers listed in this specification.

B. Doors – Flush or paneled as shown

1. Standard Duty Doors: ANSI A250.8, Level 1, Full flush seamless design of size and design shown. Use for interior locations only. Do not use for stairwell doors, security doors and detention doors.
2. Fire Rated Doors (Labeled):
   1. Conform to NFPA 80 when tested by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual for the class of door or door opening shown.
   2. Fire rated labels of metal, with raised or incised markings of approving laboratory shall be permanently attached to doors.
   3. Close top and vertical edges of doors flush. Vertical edges shall be seamless. Apply steel astragal to the meeting stile of the active leaf of pairs of fire rated doors, except where vertical rod exit devices are specified for both leaves swinging in the same direction.
   4. Construct fire rated doors in stairwell enclosures for maximum transmitted temperature rise of 230 °C (450 °F) above ambient temperature at end of 30 minutes of fire exposure when tested in accordance with ASTM E152.

C. Frames

1. Construction: 16 ga. (0.053 inch) (1.3mm) hot or cold-rolled steel at interior locations, 14 ga. (0.067 inch) (1.6mm) galvannealed A-60 at exterior locations.
2. All galvannealed frames to have galvannealed hardware reinforcements only.
3. All frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area.

4. Provide temporary shipping bars to help protect from damage during transmit and handling.
5. Temporary shipping bars to be removed before setting frames.
6. All welds on frames, transoms and sidelites to be flush with neatly mitered or butted material cutts.

D. Anchors

1. Wall anchors for frame attachment to masonry construction:
   Masonry anchors, adjustable, flat, corrugated or perforated 'T' shaped anchors with leg not less than 2 inches (50.8mm) wide by 10 inches (254mm) long or masonry "wire" type not less than 3/16 inch (5mm) diameter.
2. Wall anchors for attachment to drywall partitions
   a. Use steel or wood stud anchors sized to accomodate frame jamb depth and face dimension on all welded frames.
3. All frame jamb anchors to be provided; one each jamb per 30 inches (762mm) of frame height or fraction thereof.
4. Floor anchors: Vertically adjustable
   a. Floor anchors to be screw adjustable prior to permanent installation so as to provide the ability to plumb frame without the use of shims under jambs.
   b. Fabricate anchors to receive 2 fasteners per jamb.
5. In place masonry or concrete:
   a. 3/8 inch (9.5mm) countersunk flat head stove bolt and expansion shields.
   b. Weld pipe spacers or other type label approved spacers per manufacturer's standard design in back of frame soffit to protect frame profile during tightening of bolts and anchors.
6. Head struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure where called for on schedule.

E. Preparation For Hardware

1. Reinforcement: Reinforce components for hardware installation in accordance with SDI-107.

   a. All lock and closer reinforcements in doors to be "box" or "channel" type.
   b. All hinge reinforcements in doors to be 7 ga.
   c. All hinge reinforcements in frames to be 7 ga. (0.167 inch) (4.2mm) securely welded to the frame rabbet.
2. Punch single leaf frames to receive three (3) silencers. Double leaf frames to receive one silencer per leaf at head. Factory install silencers prior to shipment to job site.
3. Factory prepared hardware locations to be in accordance with "Recommended locations for Builders' Hardware for Standard Steel Doors and Frames", as adopted by The Steel Door Institute.
4. Supply welded in mortar guards at all hardware cutouts in frames built into masonry or grouted in full.

PART 3 EXECUTION

3.01 SETTING FRAMES

A Set all frames in accordance with SDI 105-92.

B. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.

C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

D. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door clearances and header braces for grouted frames.

E. Install frames in prepared openings in concrete and masonry walls using countersunk bolts and expansion sheilds.

F. Install all fire rated frames in accordance with requirements of NFPA-80-1999.

G. Remove factory spreader bars used for shipping from frames before setting.

3.02 DOOR INSTALLATION

A. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware.

B. Clearances at edge of doors

1. Between door and frame at head and jambs: 1/8 inch (3.2).

2. At meeting edges pairs of doors and at mullions: 1/8 inch (3.2).

3. At transom panels, without transom bars: 1/8 inch (3.2).

4. At sills without thresholds: 5/8 inch (15.9) maximum above finish floor.

5. At sills with thresholds: 1/8 inch (3.2) above threshold.

3.03 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.

B. Adjust moving parts for smooth operation. Use shims if necessary to allow for proper closing.

C. Fill all dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces - Reprime/paint to match finish.

END OF SECTION 08110

SECTION 08330 – OVERHEAD COILING SERVICE DOORS

PART 1 GENERAL

1.01 WORK under this section includes overhead coiling sheet doors as indicated on drawings.

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, General and Supplementary Conditions and Division 1 specifications sections apply to this section.

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA MG 1 - Motors and Generators.

1.05 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
Preparation instructions and recommendations.
Storage and handling requirements and recommendations.
Details of construction and fabrication.
Installation instructions.

B. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.06 QUALITY ASSURANCE

A. Overhead coiling sheet doors:

Wind Loads: Design door assembly for Series 790 doors to withstand wind/suction load of 25/37.5 psf (1197/1796 Pa) without damage to door or assembly components.
Operation: Design door assembly, including operator, to operate for not less than 10,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

D. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

E. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturers' unopened packaging until ready for install.

B. Protect from exposure to moisture.

C. Store in a dry warm ventilated weathertight location.

1.08 SEQUENCING AND SCHEDULING

A. Deliver to the jobsite in a timely manner so not to delay progress of other trades.

B. Issue purchase orders to suppliers early so not to interfere with normal quoted delivery of materials.

1.09 **WARRANTY**

A. Provide a minimum of one (1) year warranty against defects in materials and workmanship.

B. Warranty to commence with substantial completion of the job.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (providing the products supplied comply with this specification)

A. Overhead Door Corporation 652 Series or equal

2.02 OVERHEAD COILING STEEL COUNTER DOORS

A. Anodized Aluminum Counter Doors: Overhead Door Corporation 652 Series.
1. Wall Mounting Condition:
a. Between jambs mounting.
2. Curtain: Interlocking slats, Type F-158 fabricated of anodized aluminum. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.
3. Finish:
a. Anodized Finish:
1. Slats and hood clear anodized aluminum.
2. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
4. Bottom Bar: Extruded aluminum tubular shape with astragal.
5. Guides: Extruded aluminum.
a. Finish: PowderGuard Zinc Finish for guides, bottom bar and head plate.
6. Brackets: Steel plate to support counterbalance, curtain and hood.
7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel.
8. Hood: Provided with intermediate support brackets as required and fabricated of:
a. Aluminum.
9. Operation:
a. Crank operation.
10. Locking:
a. Slide bolt locks suitable for use with padlock.

PART 3 EXECUTION

11.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

11.2 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.

11.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim and closures.

G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

11.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

11.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

11.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION 08330

SECTION 08551 – ALUMINUM-CLAD WOOD DOORS & WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Aluminum-clad wood doors and windows.

1.3 RELATED SECTIONS

A. Section 07270 - Air Barriers: Water-resistant barrier.

B. Section 07920 - Joint Sealants: Sealants and caulking.

1.4 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
1. ASTM B 117 - Operating Salt Spray (Fog) Apparatus.
2. ASTM C 1036 - Flat Glass.
3. ASTM C 1048 - Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
4. ASTM D 1149 - Rubber Deterioration – Surface Ozone Cracking in a Chamber.
5. ASTM D 2803 - Filiform Corrosion Resistance of Organic Coatings on Metal.
6. ASTM D 3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
7. ASTM D 4060 - Abrasion Resistance of Organic Coatings by the Taber Abraser.
8. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
9. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
10. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
11. ASTM G 85 - Modified Salt Spray (Fog) Testing.

C. Screen Manufacturers Association (SMA):
1. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

D. Window and Door Manufacturers Association (WDMA):
1. ANSI/AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

2. ANSI/AAMA/NWWDA 101/I.S.2/NAFS-02 - Voluntary Performance Specification for Windows, Skylights and Glass Doors.

3. WDMA I.S.4 - Industry Standard for Water-Repellent Preservative Non-Pressure Treatment for Millwork.

1.5 PERFORMANCE REQUIREMENTS

A. Windows shall be Hallmark certified to a rating of C specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2.

B. Window Unit Air Leakage, ASTM E 283, 1.57 psf (25 mph): 0.05 cfm per square foot of frame or less.

C. Window Unit Water Penetration: No water penetration through window unit when tested in accordance with ASTM E 547, under static pressure of 7.5 psf (52 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.6 SUBMITTALS

A. Comply with Division 1 requirements.

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

D. Samples: Submit full-size or partial full-size sample of window illustrating glazing system, quality of construction, and color of finish.

E. **Warranty**: Submit manufacturer’s standard form in which manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within the specified warranty period, but not less than ten (10) years

1. Failures include, but are not limited to the following:

   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, or air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of wood, metals, vinyl, other materials, and finishes beyond normal weathering.
   e. Failure of insulating glass.

2. Any failures encountered prior to substantial completion will require replacement of window in its entirety.

1.7 QUALITY ASSURANCE

A. Mockup:
1. Provide sample installation for field testing window performance requirements and to determine acceptability of window installation methods.

2. Approved mockup shall represent minimum quality required for the Work.

3. Approved mockup shall remain in place within the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.

B. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements, provide products by one of the following:
1. Lincoln
2. Kolbe & Kolbe Millwork Company, Inc.
3. JELD-WEN, Inc.
4. Marvin Windows

2.2 ALUMINUM-CLAD WOOD WINDOWS

A. Aluminum-Clad Wood Casement Windows: Factory-assembled aluminum-clad wood windows with outward-opening sash installed in frame and fixed units as indicated on drawings.

B. Frame:
1. Interior Exposed Surfaces: fir, stained, clear coated
2. Exterior Surfaces: Clad with aluminum.
3. Overall Frame Depth: nom. 5 inches

C. Sash:
1. Select woods, water water-repellent, preservative-treated with EnduraGuard in accordance with WDMA I.S.-4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the sash.
2. Interior Exposed Surfaces: fir, stained, clear coated
3. Exterior Surfaces: Clad with aluminum, lap-jointed at corners.
4. Corners: Mortised and tenoned, glued and secured with metal fasteners.
5. Sash Thickness: 2-3/16 inches (56 mm).

D. Weather Stripping:

1. Dual weather stripping.
2. Continuous, flexible, polyvinyl chloride (PVC) material in dual-durometer design.
3. Units shall have welded corners, compressed between frame and sash for positive seal on all 4 sides.
4. Secondary PVC leaf-type weather strip between sash and frame for positive seals on all 4 sides.

E. Jamb:
1. Extended as required to fully encapsulate an exterior wall with nominal 6” studs and integrate properly with exterior and interior finishes. Factory applied.

F. Dividers:
1. Simulated Divided Lites (SDL) shall occur on exterior face of glazing.
2. Exterior: Cladding and color to match exterior frame.
3. Size: Nom. 1” wide

G. Units:
1. Mull together mirrored casement windows, outside hinge, with nom. 2” center mull as a whole unit in dimension as indicated on drawings.

2.3 GLAZING

A. Glazing:

2. Type:
a. Glazing System: dual-seal insulating glass, silicone-glazed clear multi-layer Low-E coated with argon.

2.5 HARDWARE

A. Operator:
1. Steel worm-gear operator with hardened gears.
2. Operator Base: Zinc die cast with painted finish.
3. Operator Linkage, Hinge Slide, and Hinge Arms: 300 series stainless steel.
4. Exposed Fasteners: Stainless steel.
5. External Hardware Salt Spray Exposure, ASTM B 117: Exceed 1,000 hours.

B. Crank Handle Finish
1. Integrated Folding Crank

C. Locking System:
1. Single-handle locking system.
2. Operate positive-acting arms that reach out and pull sash into locked position.
3. Casement Windows: One installed on sash 29 inches and smaller in frame height, 2 unison operating locks installed on sash over 29 inches in frame height.

2.6 TOLERANCES

A. Windows shall accommodate the following opening tolerances:

1. Vertical Dimensions Between High and Low Points: Plus 1/4 inch, minus 0 inch.
2. Width Dimensions: Plus 1/4 inch, minus 0 inch.
3. Building Columns or Masonry Openings: Plus or minus 1/4 inch from plumb.

2.7 FINISH

A. Exterior Finish System:
   1. Exterior aluminum surfaces shall be finished with the following multi-stage system:
      a. Clean and etch aluminum surface of oxides.
      b. Pre-treat with chrome phosphate conversion coating.
      c. Pre-treat with chromic acid sealer/rinse.
      d. Top coat with baked-on 70% fluoropolymer-based enamel.
   2. Color: by Architect, ten (10) colors minimum
   3. Performance Requirements: Exterior aluminum finishes shall meet or exceed all performance requirements of AAMA 2605.

B. Exterior Finish System Performance Requirements:
   1. Exterior aluminum finishes shall meet or exceed following performance requirements:
      a. Ozone Deterioration, ASTM D 1149, Modified: 5 ppm ozone, 160 degrees F, 60 percent relative humidity, 100 hours exposure, little or no loss of cure.
      b. Filiform Corrosion Resistance of Organic Coatings on Metal, ASTM D 2803: No corrosion.
      c. Taber Abrasion Resistance, ASTM D 4060: 500 g weight, CS-10 wheel, 500 cycles, less than 25 g weight loss.
      d. Cyclic Acidified Salt Fog Test, ASTM G 85, Appendix A-2.

C. Interior Finish: Unfinished, ready for site finishing.

2.8 INSTALLATION ACCESSORIES

A. Flashing/Sealant Tape:
   1. Aluminum-foil-backed butyl window and door flashing tape.
   2. Maximum Total Thickness: 0.013 inch.
   3. UV resistant.
   4. Verify sealant compatibility with sealant manufacturer.

B. Insulating-Foam Sealant: Dow Great Stuff Window & Door.
   1. Low-pressure, polyurethane window and door insulating-foam sealant.

2.9 SOURCE QUALITY CONTROL

A. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are

corrected.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions and approved shop drawings.

B. Install windows to be weather-tight and freely operating.

C. Maintain alignment with adjacent work.

D. Secure assembly to framed openings, plumb and square, without distortion.

E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.

F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.

G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

H. Leave windows closed and locked.

3.3 CLEANING

A. Clean window frames and glass in accordance with Division 1 requirements.

B. Do not use harsh cleaning materials or methods that would damage finish.

C. Remove labels and visible markings.

3.4 PROTECTION

A. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 08551

SECTION 08710 – DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:
   1. Architectural Hinges
   2. Continuous Hinges
   3. Key Control System, Cylinders and Cores.
   4. Locksets, Latchsets and Deadbolts
   5. Panic Devices and Fire Rated Exit Devices
   6. Closers and Door Control Devices
   7. Automatic Door Operators
   8. Overhead Door Stops and Holders
   9. Floor and Wall Stops
   10. Door Bolts and Coordinators
   11. Door Pulls, Push/Pull Plates and Push/Pull Sets
   12. Protective Plates
   13. Door Seals, Gasketing and Weatherstripping
   14. Thresholds
   15. Miscellaneous Door Control Devices
   16. Electromechanical Hardware
   17. Miscellaneous Access Control Components and Security Equipment

C. Related Sections: The following Sections contain requirements that relate to the following sections.
   1. Section 01 2000: Price and Payment Procedures
   2. Section 08 1113: Hollow Metal Doors and Frames
   3. Section 08 1400: Wood Doors
   4. Section 08 3323: Coiling Doors

D. Products furnished but not installed under this Section to include:
   1. Cylinders for locks on entrance doors.
   2. Final replacement cores and keys to be installed by Owner.

1.03 REFERENCES

A. Standards of the following as referenced:
   1. American National Standards Institute (ANSI)
   2. Door and Hardware Institute (DHI)
   3. Factory Mutual (FM)
   4. National Fire Protection Association (NFPA)
   5. Underwriters' Laboratories, Inc. (UL)
      a. UL 10C - Fire Tests Door Assemblies
   6. Warnock Hersey

B. Regulatory standards of the following as referenced:
   1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336 (ADA).
   2. CABO/ANSI A117.1: *Providing Accessibility and Usability for Physically Handicapped People*, 2010 edition.

1.04 SYSTEM DESCRIPTION

A. Refer to applicable “Headings” for system description for electric and electro-pneumatic hardware products.

1.05 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements. For items other than those scheduled in the “Headings” of Section 3, provide catalog information for the specified items and for those submitted.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format “hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc. Include the following information:
      a. Type, style, function, size, and finish of each hardware item.
      b. Name and manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
      e. Explanation of all abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.
      h. Keying information.

i. Cross-reference numbers used within schedule deviating from those specified.
   1) Column 1: State specified item and manufacturer.
   2) Column 2: State prior approved substituted item and its manufacturer.

2. Furnish complete wiring diagrams, riser diagrams, elevation drawings and operational descriptions of electrical components and systems, listed by opening in the hardware submittals. Elevation drawings shall identify locations of the system components with respect to their placement in the door opening. Operational descriptions shall fully detail how each electrical component will function within the opening, including all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply a copy with delivery of hardware to the jobsite and another copy to the Owner at the time of project completion.
3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Provide samples if requested of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.
   1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. Contract closeout submittals:
   1. Operation and maintenance data: Complete information for installed door hardware.
   2. Warranty: Completed and executed warranty forms.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.
   1. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available for consultation to Owner, Architect, and Contractor, at reasonable times during the course of the Work.

B. Coordination Meetings:
   1. Contractor to set up and attend the following:
      a. Lock distributor to meet with the Owner to finalize lock functions and keying requirements and to obtain final instructions in writing.
      b. Lock distributor and lock, closer and exit device manufacturer to meet with the installer prior to beginning of installation of door hardware. Instruct installer on proper installation of specified products.
   2. General Contractor to set up and attend the following:
      a. Meet with the Owner, General Contractor, Supplier, electrical and security contractors to coordinate all electrical hardware items. Supplier to provide riser diagrams, elevation drawings, wiring diagrams and operational descriptions as required by the General and sub-contractors.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction.
   1. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware to comply with State and local codes and UL 10C.
   2. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

D. All hardware is to comply with Federal and State Handicap laws.

E. Substitutions: Request for substitutions of items of hardware other than those listed as "acceptable and approved" shall be made to the architect in writing no later than fourteen (14) days prior to bid opening. Approval of substitutions will only be given in writing or by Addenda. Requests for substitutions shall be accompanied by samples and/or detailed information for each manufacturer of each product showing design, functions, material thickness and any other pertinent information needed to compare your product with that specified. Lack of this information will result in a refusal.

F. Pre-Installation Coordination:
   1. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years' experience in successful completion of projects similar in size and scope.
   2. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
   3. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.
   4. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.07 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.08 WARRANTY

A. Special warranties:
1. Locks and Cylinders: Three Year Period
2. Door Closers: Twenty Five Year Period

1.09 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions that are packed in hardware items for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Parts kits: Furnish manufacturers' standard parts kits for locksets, exit devices, and door closers.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS
(*Denotes manufacturer referenced in the Hardware Headings)

A. Hinges:
1. Acceptable manufacturers:
a. Ives*
b. Bommer
c. McKinney
2. Characteristics:
a. Templates: Provide only template-produced units.
b. Screws: Provide Phillips flat-head screws complying with the following requirements:
1) For metal doors and frames install machine screws into drilled and

tapped holes.

2) For wood doors and frames install threaded-to-the-head wood screws.
3) For fire-rated wood doors install #12 x 1-1/4 inch, threaded-to-the-head steel wood screws.
4) Finish screw heads to match surface of hinges or pivots.

c. Hinge pins: Except as otherwise indicated, provide hinge pins as follows:
1) Out-Swing Exterior Doors: Non-removable pins.
2) Out-Swing Corridor Doors with Locks: Non-removable pins.
3) Interior Doors: Non-rising pins.
4) Tips: Flat button and matching plug. Finished to match leafs.

d. Size: Size hinges in accordance with specified manufacturer's published recommendations.

e. Quantity: Furnish one pair of hinges for all doors up to 5'-0" high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof, unless otherwise specified in Hardware Headings.

B. Geared Continuous Hinges:
1. Acceptable manufacturers:
a. Ives*
b. Select Products
c. Markar
2. Characteristics:
a. Continuous gear hinges to be manufactured of extruded 6063-T6 aluminum alloy with anodized finish, or factory painted finish as scheduled.
b. All hinges are to be manufactured to template. Uncut hinges to be non-handed and to be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising.
c. Vertical door loads to be carried on chemically lubricated polyacetal thrust bearings. The door and frame leaves to be continually geared together for the entire hinge length and secured with a full cover channel. Hinge to operate to a full 180°.
d. Hinges to be milled, anodized and assembled in matching pairs. Fasteners supplied to be steel self-drilling, self-tapping 12-24 x ¾" screws.
e. Provide UL listed continuous hinges at fire doors. Continuous hinges at fire doors (suffix -FR) to meet the required ratings without the use of auxiliary fused pins or studs.

C. Cylinders:
1. Acceptable manufacturers:
a. Match existing keying system or establish new keying system per owner direction
2. Characteristics:
a. Existing System: Grandmaster key the locks to the Owner's existing system, with a new master key for the Project.
b. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated into Owner's existing system.

c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
d. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
    1) Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, “DO NOT DUPLICATE”.
e. Key Material: Provide keys of nickel silver only.
f. Key Quantity: Furnish (3) change keys for each lock, (5) master keys for each master system, (5) grandmaster keys for each grandmaster system, (10) construction master keys.
    1) Furnish one extra blank for each lock.
    2) Furnish construction master keys to General Contractor.
    3) Deliver keys to Owner.

D. Mortise Locksets and Latchsets: as scheduled.
1. Acceptable manufacturers:
    a. Schlage L9000 Series*
    b. Corbin Russwin ML2000
    c. Best 47H Series
2. Required Features:
    a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
    b. Latchbolts: 3/4-inch throw stainless steel anti-friction type.
    c. Lever Trim: Through-bolted, accessible design, cast or solid rod lever as scheduled. Spindles: Independent break-away.
    d. Thumbturns: Accessible design not requiring pinching or twisting motions to operate.
    e. Deadbolts: Stainless steel 1-inch throw.
    f. Electric operation: Manufacturer-installed continuous duty solenoid.
    g. Strikes: 16 gage curved stainless steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
    h. Scheduled Lock Series and Design: Schlage L series, MATCH EXISTING design.
    i. Certifications:
        1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
        2) ANSI/ASTM F476-84 Grade 30 UL Listed.

E. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled, fastened with through-bolts.
1. Acceptable manufacturers:
    a. Schlage ND Series*
    b. Corbin Series CL3300
    c. Best 9K Series
2. Required Features:
    a. Chassis: Cylindrical design, corrosion-resistant plated cold-rolled steel.
    b. Locking Spindle: Stainless steel, interlocking design.
    c. Latch Retractors: Forged steel. Balance of inner parts: Corrosion-resistant plated steel, or stainless steel.
    d. Lever Trim: Accessible design, independent operation, spring-cage

supported, minimum 2" clearance from lever mid-point to door face.

e. All lock functions: 7 year warranty, Vandalguard function outside lever is disengaged when in the locked mode.
f. Rosettes: Minimum 3-7/16" diameter for coverage of ANSI/DHI A115.18, 1994 door preparation, through-bolt lugs on both spring cages to fully engage this pattern.
g. Springs: Full compression type.
h. Electric operation: Manufacturer-installed continuous duty solenoid.
i. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
j. Lock Series and Design: Schlage ND series, MATCH EXISTING design.
k. Certifications:
    1) ANSI A156.2, 1994, Series 4000, Grade 1. Tested to exceed 3,000,000 cycles.
    2) UL listed for A label single doors up to 4 ft x 8 ft.

F. Deadbolts: as scheduled. Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" dia. steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike with 1/8" thick strike reinforcement and two 3" long screws. ANSI A156.5, 1992 Grade 1 certified.

G. Closers and Door Control Devices:
1. Acceptable manufacturers:
    a. LCN Closers 4050 Series*
    b. Norton 7500
    c. Sargent 351
2. Characteristics:
    a. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
    b. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
    c. Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
    d. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
    e. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
    f. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
    g. Pressure Relief Valve (PRV) Technology: Not permitted.
    h. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

H. Closers and Door Control Devices:
   1. Acceptable manufacturers:
      a. LCN Closers 1450 Series*
      b. Norton 8501 Series
      c. Sargent 1331 Series
   2. Characteristics:
      a. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
      b. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
      c. Closer Body: 1-1/4 inch (32 mm) diameter, with 5/8 inch (16 mm) diameter heat-treated pinion journal and full complement bearings.
      d. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
      e. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
      f. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
      g. Pressure Relief Valve (PRV) Technology: not permitted.
      h. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

I. Overhead Door Holders:
   1. Acceptable manufacturers:
      a. Glynn Johnson*
      b. Rixson Firemark
   2. Characteristics:
      a. Provide heavy duty surface mounted door holders of stainless steel.
      b. Concealed holders to be installed with the jamb bracket mortised flush with the bottom of the jamb. The arm and channel to be mortised into the door.
      c. Surface holders to be installed with the jamb bracket mounted on the stop.

J. Floor Stops and Wall Bumpers:
   1. Acceptable manufacturers:
      a. Ives*
      b. Trimco
      c. Rockwood Manufacturing
   2. Characteristics: Refer to Hardware Headings.

K. Push Plates:
   1. Acceptable manufacturers:
      a. Ives*
      b. Trimco
      c. Rockwood Manufacturing
   2. Characteristics:
      a. Exposed Fasteners: Provide manufacturers standard exposed fasteners.
      b. Material to be forged stainless steel, per the Hardware Headings.
      c. Provide plates sized as shown in Hardware Headings.

L. Door Pulls & Pull Plates:
   1. Acceptable manufacturers:
      a. Ives*
      b. Trimco
      c. Rockwood Manufacturing
   2. Characteristics:
      a. Provide concealed thru-bolted trim on back to back mounted pulls, but not for single units.
      b. Material to be forged stainless steel.
      c. Provide units sized as shown in Hardware Headings.

M. Push Pull Sets:
   1. Acceptable manufacturers:
      a. Ives*
      b. Trimco
      c. Rockwood Manufacturing
   2. Characteristics:
      a. Provide mounting systems as shown in hardware sets.
      b. Material to be tubular stainless steel.
      c. Provide Push/Pull sets sized as shown in Hardware Headings.

N. Protective Plates:
   1. Acceptable manufacturers:
      a. Ives*
      b. Trimco
      c. Rockwood Manufacturing
   2. Characteristics:
      a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
      b. Materials:
         1) Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
      c. Fabricate protection plates not more than 2 inches less than door width on push side and not more than 1 inch less than door width on pull side.
      d. Heights:
         1) Refer to hardware headings for specific sizes.
         2) Kick plates to be 8 inches in height.
         3) Mop plates to be 6 inches in height.
         4) Kick plates and Mop plates to be 1” less that bottom rail height where applicable.
         5) Armor plates to be 34 inches in height. Armor plates on fire doors to comply with NFPA 80.

O. Thresholds:
   1. Acceptable manufacturers:
      a. Zero Weatherstripping Co., Inc.*
      b. Pemko
      c. Reese Industries
   2. Types: Indicated in Hardware Headings.

P. Door Seals/Gasketing:
   1. Acceptable manufacturers:
      a. Zero Weatherstripping Co., Inc.*
      b. Pemko
      c. Reese Industries
   2. Types: Indicated in Hardware Headings.

Q. Silencers:
   1. Acceptable manufacturers:
      a. Ives*
      b. Hager
      c. Rockwood Manufacturing
   2. Three for each single door; two for each pair of doors.

R. Key Cabinet and System:
   1. Acceptable manufacturers:
      a. Telkee, Inc.
   2. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the project.
      a. Provide complete cross index system set up by key control distributor, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
      b. Provide hinged-panel type cabinet for wall mounting.
      c. Provide multiple-drawer type cabinet.

2.02 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
   1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
   2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint" surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
   4. Use thru-bolts for installation of all exit devices, closers, and surface-mounted overhead stops. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, provide sleeves for each thru-bolt as a means of reinforcing the work, or provide sex nuts and bolts.

2.03 HARDWARE FINISHES

A. Match items to the manufacturer’s standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by ANSI or, if none established, match the Architect’s sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. FIELD VERIFY AND MATCH EXISTING FINISH

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
   1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
   2. "Recommended Locations for Builders Hardware for Custom Steel Doors and

Frames" by the Door and Hardware Institute.

3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section “Joint Sealers”.

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Door Hardware Supplier's Field Service:

1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
3. File written report of this inspection to Architect.

3.03 HARDWARE SCHEDULE

HARDWARE SET: 01

DOOR NUMBER:
A201

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	ENTRY LOCK	L9456	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4050 SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: 02

DOOR NUMBER:
A101

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	ENTRY LOCK	L9456	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4050 REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	OH STOP	90S	GLY
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA (EXT MOUNT)	ZER
1	THRESHOLD	656A-223	ZER

HARDWARE SET: 03

DOOR NUMBER:
A103

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4050 REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	OH STOP	90S	GLY
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA (EXT MOUNT)	ZER
1	THRESHOLD	656A-223	ZER

HARDWARE SET: 04

DOOR NUMBER:
A106

EACH TO HAVE:

2	CONT. HINGE	224XY	IVE
2	FLUSH BOLT	FB458	IVE
1	STOREROOM LOCK	L9080	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4050 SCUSH	LCN
2	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	ASTRAGAL	43STST	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: 05

DOOR NUMBER:
A104 A105

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	CR DEADBOLT	L463	SCH
1	CYL/CORE	AS REQUIRED	
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4050 REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	OH STOP	90S	GLY
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA (EXT MOUNT)	ZER
1	THRESHOLD	656A-223	ZER

HARDWARE SET: 06

DOOR NUMBER:
A102

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	ND70	SCH
1	CYL/CORE	AS REQUIRED	
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS406/407CCV	IVE

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum, wind driven rain resistant, stationary louver with horizontally mounted sight proof blades.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 60 00 - Flashing and Sheet Metal.

C. Section 07 92 00 - Joint Sealants.

D. Section 09 91 00 - Paints.

E. Section 23 33 13 – Dampers.

F. Section 23 09 13 – Instrumentation and Control Devices for HVAC.

1.3 REFERENCES

A. AAMA 2604 – High Performance Organic Coatings on Architectural Extrusions and Panels.

B. AAMA 2605 - High Performance Organic Coatings on Architectural Extrusions and Panels.

C. AAMA611 – Voluntary Specification for Anodized Architectural Aluminum.

D. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

E. AMCA 511 - Certified Ratings Program for Air Control Devices.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

I. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings

J. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

K. ASTM D2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.

1.4 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: For each product to be used, including:
1. Manufacturer's product data including performance data.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Shop Drawings:
1. Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.

D. Product Schedule: For louvers. Use same designations indicated on Drawings.

E. Samples: Submit sample of louver to show frame, blades, bird screen, gutters, downspouts, vertical supports, sill, accessories, finish, and color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of louver, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. The manufacturer shall have implemented the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and expectations are met.
2. Manufacturer shall be International Organization for Standardization (ISO) 9001 accredited.

B. Product Qualifications:

1. Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.
2. Louvers shall be factory engineered to withstand the specified seismic loads.
   a. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. Manufacturer shall provide standard limited warranty for louver systems for a period of five years (60 months) from date of installation, no more than 60 months after shipment from manufacturing plant. When notified in writing from the Owner of a manufacturing defect, manufacturer shall promptly correct deficiencies without cost to the Owner.

B. Manufacturer shall provide 20 year limited warranty for fluoropolymer-based finish on extruded aluminum substrates.
Finish coating shall not peel, blister, chip, crack or check.
Chalking, fading or erosion of finish when measured by the following tests:
   a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
   b. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822.
   c. Finish coating shall not erode at a rate in excess of 10%/ 5 year as determined by Florida test sample.

C. Manufacturer shall provide a 5 year limited warranty for Class I and a 3 year limited warranty for Class II anodized finish on extruded aluminum substrates.
   1. Seller warrants the Finish under normal atmospheric conditions.
      a. Will not crack, craze, flake or blister
      b. Will not change or fade more than (5) Delta-E Hunter units as determined by ASTM method D-2244
      c. Will not chalk in excess of ASTM D-4214-07 number (8) rating, determined by the procedure outlined in ASTMD-4214-07 specification test.
   2. Any forming or welding must be done prior to finishing. Post forming or welding will void the warranty.

3. This Warranty applies only if the anodized aluminum product is installed in strict accordance with Seller's recommended practices and maintained in accordance with AAMA (American Architectural Manufacturers Association) publication number 609 and 610-09 ("Cleaning and Maintenance Guide for Architecturally Finished Aluminum").

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Ruskin Company or equal

2.2 STATIONARY BLADE LOUVER

A. Model: ELF375DX(D Half Round Top
B. Fabrication: Sightproof/Hidden support style.
   1. Frame: Double frame design.
      a. Frame Depth: 4"
      b. Material: Extruded aluminum, Alloy 6063-T6.
   2. Blades:
      a. Style: Horizontal sinusoidal.
      b. Material: Formed aluminum, Alloy 6063-T6.
   3. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.
   4. Vertical Supports: Hidden vertical supports to allow continuous line appearance spaced a maximum of 120 inches (3048 mm).
      a. Continuous Blade Style – Design incorporates visible mullions or frames at the perimeter of the louver only. Rear-mounted hidden blade supports are utilized at section joints and at intermediate locations as needed. Louver blade sightlines are not interrupted at section joints or blade support locations. The rear-mounted blade support depth varies depending on louver height and the design windload.
   5. Nominal assembly size: 10 feet wide by 2 feet high
   6. Half round top profile

C. Performance Data:
   1. Performance Ratings: AMCA licensed.
      a. Based on testing 48 inch by 48 inch (1219 mm by 1219 mm) size unit in accordance with AMCA 500.
   2. Free Area: 49 percent, nominal.
   3. Free Area Size: 7.87 sf (.73 sm).

D. Wind Driven Water Penetration Performance:
   1. Based on testing 39 inches x 39 inches (1 m x 1 m) core area, 41 inches x 44 inches (1.04 m x 1.12 m) nominal size unit in accordance with AMCA 500-L.
   2. Wind Velocity: 29 mph (47 kph).
      a. Rainfall Rate: 3 inches/hour (76 mm/hour).
      b. Free Area Velocity: 102 feet per minute (0.5 m/sec).
      c. Water Resistance Effectiveness: 99.3% (AMCA Class A).

2.3 ACCESSORIES

A. Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, factory installed with removable fasteners and neoprene gaskets.

B. Insulated Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, 1 inch (25 mm) aluminum skin insulated core, factory installed with removable fasteners and neoprene gaskets.

C. Insulated Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, 2 inch (51 mm) aluminum skin insulated core, factory installed with removable fasteners and neoprene gaskets.

D. Hinged Frame: Continuous piano hinge attached to angle subframe.

E. Hinged Frame: Continuous piano hinge attached to channel subframe.

F. Filter Racks: Formed channel racks to accept standard [1 inch (25 mm)] [2 inch (51 mm)] thick filters. Unused bottom portion blanked off with 0.040 inch (1 mm) aluminum sheet.

G. Security Bars:
1. Location: Front.
2. Location: Rear.
3. Construction: Aluminum, 3/4 inch x 1/2 inch (19 mm x 13 mm), welded to louver.

H. Bird Screen:
1. Aluminum: Aluminum, 5/8 inch by 0.040 inch (16 mm by 1 mm), expanded and flattened. Frame: Removable.

I. Insect Screens:
1. Aluminum: 18-16 mesh, mill finish, .011 inch (0.3 mm) wire.
2. Frame: Aluminum.

J. Extended Sills:
1. Extruded aluminum, Alloy 6063-T6. Minimum nominal thickness 0.060 inch (1.5 mm).

K. Visible Mullions: Manufacturer's standard horizontal or vertical visible mullions for architectural accent as indicated on drawings.

2.4 FINISHES

A. Finish: 70 percent PVDF: Finish shall be applied at 1.2 mil total dry film thickness.
1. Coating shall conform to AAMA 2605. Apply coating following cleaning and pretreatment. Cleaning: AA-C12C42R1X.
a. color by architect. Min. 15 standard colors
2. 20-year finish warranty.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

B. If opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean opening 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.

3.3 INSTALLATION

A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.

C. Install joint sealants as specified in Section 07 92 00.

D. Apply field topcoat within 6 months of application of shop prime coat. Apply field topcoat as specified in Section 09 91 00.

E. Utilizing louver as a benchmark profile, use 2x wood framing to construct gable with continuous front to back top radius and form into existing roof. Install 5/8 plywood over framing and install standing seam roof panels as specified over ice and water shield along length. Install prefinished metal facia trim at roof to louver location. Flash into new standing seam metal roof.

3.4 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions.

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

END OF SECTION

SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Tile backing panels as required.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood members supporting gypsum board.
2. Division 7 Section "Thermal Insulation" for insulation installed in assemblies that incorporate gypsum board.
3. Division 9 Section “Painting” for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.
b. BPB America Inc.
c. G-P Gypsum.
d. Lafarge North America Inc.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple.
h. USG Corporation.

B. Type X:

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes as applicable:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    e. Expansion (control) joint.
    f. Curved-Edge Cornerbead: With notched or flexible flanges.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool. Occurs at all interior partitions.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

G. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces, unless otherwise indicated.
2. Ceiling Type: Ceiling surfaces.
3. Moisture- and Mold-Resistant Type: At all showers, toilets and similar wet areas.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use where indicated.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.
5. Curved-Edge Cornerbead: Use at curved openings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

5. Level 5: At all gypsum board high walls, bulkheads and ceilings at Lobby C100 and at Media Center C124, and at other locations where indicated on Drawings.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

SECTION 09512 - LAY-IN CEILINGS

PART 1 - GENERAL

1.01 GENERAL

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

1.02 SUMMARY

A. Types of lay-in ceilings specified include the following:

(1) Non-fire-resistance Rated lay-in Vinyl-faced gypsum board panel ceilings: Square edge, in exposed steel grid with aluminum cap, as scheduled on Drawings.

B. See Drawings for locations of various ceiling types.

C. Related Section: See Electrical Drawings and Specifications for new light fixture locations, and fixture support requirements.

D. Related Section: See Mechanical Drawings and Specifications for grilles, registers and diffusers in lay-in ceilings.

1.03 SUBMITTALS

A. Product data: Submit manufacturer's technical data for each type of lay-in ceiling unit and suspension system required.

B. Samples: Submit manufacturer's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component required.

C. Certificates: Submit certificates from testing laboratories attesting that acoustical ceiling products comply with specification requirements.

1.04 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspection agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspection agency.

(1) Surface Burning Characteristics: As follows, tested per ASTM E 84.

(a) Flame spread: 25 of less.
(b) Smoke developed: 50 or less.

1.05 SYSTEMS DESIGN CRITERIA

A. Structural Criteria: Suspension system including all its components, hangers and fastening devices shall be capable of supporting lighting fixtures, ceiling grilles, and lay-in units without deflecting more than 1/360 of span when tested as a simple beam-end free center reading.

1.06 COORDINATION OF WORK

A. Coordinate layout and installation of ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any). Centerlines for ceiling system shall be established and maintained by Contractor. All trades shall work to these lines.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle ceiling units carefully to avoid chipping edges or damaging units in any way.

1.08 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels. Lay-in ceiling units: Furnish quantity of full size units equal to 2.0% of amount installed.

1.09 **GUARANTEE**

A. All materials and workmanship furnished under this section of the specifications shall be guaranteed in writing for a **period of five (5) years from date of acceptance of the building** and any defective materials or workmanship shall be replaced during this period without cost to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:

(1) Armstrong World Industries.
(2) BPB America Inc.
(3) USG Acoustical Products Co.

B. Lay-in Vinyl Faced Gypsum Board Panels at Non-fire-resistance-rated Ceilings: To establish minimum design and quality standards, vinyl-faced gypsum board panels shall be equal to SheetRock Brand ClimaPlus, White, No. 3260, by USG, Inc. (24" x 24" x 1/2").

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for metal suspension systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C-635 requirements.

B. Finishes and colors: Provide manufacturer's standard factory-applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated, or if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.

C. Attachment devices: Size for 5 times design load indicated in ASTM C-635, Table 1, Direct Hung.

(1) Hanger wire: Galvanized carbon steel wire, ASTM A-641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C-635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.

D. Edge moldings and trim: Steel or Aluminum of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

A. Non-fire-resistance-rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from cold rolled steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:
(1) Material at lay-in gypsum board ceilings: Double-web hot-dipped galvanized steel with aluminum cap.
(2) Material at lay-in acoustical ceilings: Double-web hot dipped galvanized steel.
(3) Structural classification: Intermediate-duty system.
(4) Finish: Painted, white.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

(1) Manufacturers of Non-fire-resistance-rated Double Web Steel Suspension Systems:

(a) Chicago Metallic Corporation
(b) Armstrong World Industries, Inc. (Prelude XL and Prelude XL Fire Guard)
(c) Donn, USG, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Measure each ceiling area and establish layout of lay-in units to balance border widths at opposite edges of each ceiling. **Avoid use of less-than-half width units at borders**.

3.02 INSTALLATION

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and CISCA standards applicable to work.

B. Arrange acoustical units as follows:
   (1) Install tile in non-directional pattern.

C. Install suspension systems to comply with ASTM C-635, with hangers supported only from building structural steel or precast concrete members. Locate hangers not less than 6" from each end and spaced 4'-0" o.c. each carrying channel or direct-hung runner.unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

   (1) Secure wire hangers by looping and wire-tying directly to structure or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
   (2) Install hangers plumb and free from contact with insulation or others objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hanges only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.

D. Install edge moldings of type indicated at perimeter of ceiling areas and at locations where necessary to conceal edges of units.
   (1) Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with suspension system to tolerance of 1/8" in 12'-0". Miter corners neatly, accurately, and connect securely.

E. Install panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels ot fit accurately at borders and at penetrations.

F. Frame around pipe supports and miscellaneous bracing. Main beams and cross tees shall be spaced to accommodate recessed light fixtures and ceiling grilles as shown on Electrical and Mechanical. Furnish and install extra beams and tees as required for installation of light fixtures. Support grid system at corners of all lay-in light fixtures and other ceiling-mounted items.

   (1) Ceiling contractor shall furnish and install grid tie-wire supports at corners of all recessed light fixtures. See Electrical Specifications for specific support requirements of all interior fixtures.

3.03 CLEANING

A. Clean exposed surfaces of all lay-in ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09512

SECTION 09650 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of resilient flooring and accessories is shown and scheduled on drawings.

B. Types of resilient flooring specified in this Section include:

(1) Cove-type Rubber Base
(2) High performance luxury vinyl tile/plank

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories adhesives, sealants, and leveling compounds.

B. Fire test Performance: Provide resilient flooring which complies with fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.

B. Samples for Initial Selection Purpose: Submit manufacturer's standard color charts in form of actual sections of resilient and patterns available, for each type of resilient flooring required.

C. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.05 PROJECT CONDITIONS

A. Maintain minimum temperature of 65 deg. F. (18 deg. C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently maintain minimum temperature of 55 deg. F (13 deg. C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.06 EXTRA STOCK

A. Furnish and deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

(1) Manufacturers of Rubber Wall Base, Resilient Accessories:
Roppe Rubber Corp. or equal
(a) Rubber Wall Base: Roppe Pinnacle, 6” – color by architect, use outside corner units where required

(2) Manufacturers of High Performance Luxury Vinyl Tile/Plank:
Shaw Contract – Reside or pre-approved equal

(3) Color by architect

2.02 ACCESSORIES

A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, Type I, with matching end stops and preformed corner units, and as follows:

(1) Height: 6”
(2) Thickness: 1/8" gage.
(3) Color: As selected from manufacturer’s standard colors.
(4) Style: Standard top-set cove.
(5) Finish: Matte.
(6) Provide outside corner units where required.
(7) Roppe Pinnacle – color by architect

B. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions. All adhesives shall be asbestos-free. Applied with mult-nozzle or roller as required to eliminate ghosting through product.

C. Carpet Edge Guards: Schluter Systems, Schluter-Reno-U, AEU 80
Transitions form carpet to Porcelain Tile

D. Vinyl Tile Reducer Strip: Roppe Rubber Reducer #45 – color by architect
Transitions from vinyl to bare concrete

PART 3 - EXECUTION

3.01 INSPECTION

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes,

ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

C. DO NOT allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.02 PREPARATION

A. Prepare subfloor surfaces as follows:

(1) Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
(2) Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
(3) Where scheduled to be installed, remove existing flooring and adhesive, if present, to provide a smooth uniform surface for installation.

B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.

C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION, GENERAL

A. Install resilient flooring and/or accessories in patterns indicated on Drawings, using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

B. Scribe, cut, and fit resilient flooring and/or accessories to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.04 INSTALLATION OF ACCESSORIES

A. Apply accessories to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed outside corner units and mitered or coped inside corners. Tightly bond accessories to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

(1) On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

3.05 CLEANING AND PROTECTION

A. Perform following operations immediately upon completion of resilient flooring:

(1) Sweep or vacuum floor thoroughly.
(2) Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
(3) Damp-mop floor being careful to remove black marks and excessive soil.
(4) Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturer.

B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer’s directions.

(1) Apply protective floor polish to resilient flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercially available metal cross-linked acrylic product acceptable to resilient flooring manufacturer.

C. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.

END OF SECTION 09650

SECTION 09900 – PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE

A. Provide all materials, labor, services and incidentals necessary for the completion of this section of the Work.

B. Paint the work of all trades, including Divisions 15 and 16.

C. Related work specified elsewhere:

(a) Shop prime coats of paint: Refer to other Sections.

1.03 SUBMITTALS

A. Paint Materials List: Submit complete and detailed list of materials within 30 days after construction is started for Architect approval before ordering. Include the following information for each material to be used:

(1) Type of surface or use as stated in Painting Schedule herein.
(2) Type of material, description, application method.
(3) Brand name, exact identification.
(4) Manufacturer.

B. Samples:

(1) Submit manufacturer’s color charts in duplicate to the Architect within 30 days after the award of the contract with the Paint Materials List.
(2) Provide two samples of stained finish on hardwood, for each type specified, to Architect for approval prior to starting work. Samples shall be on specified wood and 4" x 8" in size.
(3) Colors will be selected by the Architect and submitted to the Contractor in scheduled form. More than one color will be selected.

1.04 ENVIRONMENTAL CONDITIONS

A. Perform all exterior work during favorable weather conditions only and when temperature is 50 degrees F or above.

B. Adequately ventilate all spaces to remove all moisture of construction from building to prevent mildew and improper drying of paint.

C. Maintain constant temperature of 65 degrees F or above after painting has started. Avoid wide variations of temperature.

D. Before painting has started in any area, broom clean and remove all direct dust.

E. After painting is started, broom cleaning not allowed. Use commercial vacuum cleaning equipment only for cleaning.

1.05 PRODUCT DELIVER, STORAGE AND HANDLING

A. Deliver materials to the Project Site in strong, undamaged, waterproof containers with manufacturer's labels intact. Materials in previously opened or unsealed containers are not acceptable.

B. Immediately upon delivery to the Project Site, store and lock all paint materials in an area within the building. Keep locked at all times except when materials are being prepared or removed for use on the Project.

PART 2 - PRODUCTS

2.01 GENERAL

A. No materials will be allowed on the Project Site at any time during construction except those of the manufacturer's specified or approved by the Architect.

B. Mix all materials in and apply directly from containers in which they are purchase except when use of other containers is approved by the Architect.

2.03 QUALITY

A. Certain manufacturer's products are specified herein to simplify description of types and qualities of finishes required. Only the highest quality materials are acceptable.

B. Primers: As specified by manufacturer of finish paint used and as approved by the Architect.

C. Turpentine: Conform to FS TT-T-801.

D. Mineral Spirits: Conform to FS TT-T-291A, Grade 1.

E. Linseed Oil: Conform to FS TT-L-190 (boiled).

F. Shellac: Conform to FS TT-S-300 4 lb. cut.

G. Thinners: As recommended by the manufacturer of the specified paint material.

2.04 MANUFACTURERS

Benjamin-Moore
Pre-approved equal

PART 3 - EXECUTION

3.01 GENERAL

A. Examine all surfaces to see that they are in proper condition to be finished before proceeding with the work. Starting work will constitute the painter's acceptance of preceding work and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

B. Number of coats and quality of finish shall be in accordance with these specifications, which require the use of materials that will produce first quality finish if properly applied.

C. Except as otherwise approved by the Architect, apply all paint by roller or brush application. Roller application not permitted for stain and transparent finishes.

D. Protect the work of this section and work of others during progress against damage and promptly repair such damage such any occur. Cover factory finished members with heavy paper and masking tape. Do not allow masking tape to touch finished surfaces.

E. Paint all exposed surfaces, whether or not colors are designated in any “schedule”, except where the natural finish of the material is obviously intended or a surface is specifically noted not to be painted.

F. There will be multiple colors utilized throughout the building at the discretion of the architect. The underside of the roof deck and bar joists shall be painted in a graduated tone from light at the exterior door side of the tenant space to a dark tone at the mall entry door end. Blending of colors for this purpose will be required.

3.02 PREPARATION OF SURFACES

A. General:

(1) Clean all surfaces and protect from dampness.
(2) Remove all foreign material which will adversely affect adhesion or appearance of applied coatings.
(3) Remove all efflorescence from masonry to be painted.

B. Wood:

(1) Touch up knots, resinous spots, etc., on both new and existing surfaces with WP 578 sealer 18 hours before applying prime coat of paint.
(2) Sand to smooth surface and dust before priming.
(3) Putty nail holes, cracks and blemishes after priming coat has dried. Fill nail holes flush. Concave filled holes not acceptable.
(4) Match putty color to finish coat.

C. Metal:

(1) Clean greasy or oily surfaces with turpentine or mineral spirits and wipe dry with clean cloths before applying any materials.
(2) Remove rust and scale before painting and treat with rusticide.
(3) Touch-up weld, cuts and scratches or scuffed marks with metal protective primer. (Primer shall match initial coat.) Fill all dents or scratches with spot putting DLF-40 by Ditzler Color Division and sand level and smooth before painting. Grind if necessary to remove shoulders.
(4) Clean all galvanized metal surfaces with proprietary cleaner designed for this purpose, used in accordance with their manufacturer’s directions before applying the first coat of paint.

D. Cementitious Materials: Prepare cementitious surfaces of concrete and concrete block to be painted by removing efflorescence, chalk, dirt, dust, grease and oils. Do not paint over surface where alkalinity or moisture content exceeds that permitted in manufacturer’s printed directions.

E. Drywall:

(1) Fill all irregularities with patching material and sand to smooth level surface.
(2) When sanding, avoid raising nap of paper.

3.03 APPLICATION

A. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. Allow additional time until finish is dry if necessary.

B. Finish tops, edges, bottoms of all doors same as faces. Remove door if necessary.

C. Only the best workmanship is acceptable. All material shall be spread and smoothly flowed on without run, streaks, sags, brush marks, unfinished patches or other blemishes.

D. Remove finish hardware prior to finish doors.

E. Apply coats of material in strict accordance with manufacturer's current published specifications except where requirements of these specifications are in excess of manufacturer's requirements.

F. Sand lightly between coats at no additional cost when undercoats, stains or other conditions show through the final coat until paint film is of uniform finish, color and appearance.

G. Paint interior surfaces of ducts visible through registers, grilles with flat, non-specular black paint.

H. Paint back side of all access panels, hinged covers to match exposed surfaces.

3.04 CLEAN-UP

A. Clean all paint spots from all work and touch up or otherwise repair any defective or damaged work.

B. Remove all surplus materials and equipment after work is completed, except leave excess paint with Owner for future touch-up work.

C. Leave entire job clean and acceptable to Architect.

D. Perform all "touch-up" work necessary after other mechanics have finished their work.

3.05 SCHEDULE OF FINISHES

A. General: The following specification for finishing is not intended to mention every particular item which will receive painter's finish, but it is intended to establish type and quality of finish which will be required on various materials.

B. EXTERIOR PAINT SCHEDULE:

(1) General: Provide the following paint systems for the various substrates indicated.

(2) Ferrous materials:
1st Coat: red lead pigmented primer (TT-P-86, Type III) or equal to B50NZ6 Kemkronik Universal Metal Primer
2nd Coat: semi-gloss alky enamel (TT-E-529, Class A).
3rd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
First coat not required on items delivered shop primed.

(3) Zinc Coated Metal:
1st Coat: Zinc dust-zinc oxide primer (TT-P-641) or equal to B50WZ30 Galvite HS Primer
2nd Coat: Enamel undercoater (TT-E-543)
3rd Coat: Semi-gloss enamel (TT-E-509)
Not less than 2.5 mils dry film thickness.

C. INTERIOR PAINT SCHEDULE:

(1) General: Provide the following paint systems for the various substrates indicated.

(2) Zinc Coated Metal:
1st Coat: zinc dust-zinc oxide primer (TT-P-641) or equal to B50WZ30 Galvite HS Primer
2nd Coat: enamel undercoater (TT-E-543).
3rd Coat: semi-gloss enamel (TT-E-509).

Not less than 2.5 mils dry film thickness.
Extent: Electrical panelboard conduit covers, if any.

(3) Ferrous Metals:
1st Coat: Enamel undercoater (TT-E-543). Touch-up shop primer as required.
2nd Coat: Semi-gloss enamel (TT-E-509).
3rd Coat: Semi-gloss enamel (TT-E-509).
No less than 2.5 mils dry film thickness.
First coat not required on items delivered shop primed.

(4) Wall Systems:

a. Eggshell Finish

b.

1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

(5) Ceiling Systems: t

c. Eggshell Finish

1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

END OF SECTION 09900

SECTION 10155 – Stainless Steel Toilet Partitions

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stainless steel partitions.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Concealed steel support members.

B. Section 06110 - Wood Framing: Concealed wood framing and blocking for compartment support.

C. Section 10800 - Toilet and Bath Accessories.

1.3 REFERENCES

A. ASTM International:
   1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
   3. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Literature indicating typical panel, pilaster, door, hardware and fastening.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings:
   1. Dimensioned plans indicating layout of toilet compartments.
   2. Dimensioned elevations indicating heights of doors, pilasters, separation partitions, and other components; indicate locations and sizes of openings in compartment separation partitions for toilet and bath accessories to be installed in partitions; indicate floor and ceiling clearances.
   3. Details indicating anchoring components (bolt layouts) and methods for project conditions; indicate components required for installation, but not supplied by toilet compartment manufacturer.

D. Selection Samples: For each finish product specified, one complete set of color selection guides representing manufacturer's full range of available colors, textures and patterns.

E. Verification Samples: For each finish product specified, two samples representing actual product, color, texture and pattern.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

C. Lay cartons flat, with adequate support to ensure flatness and to prevent damage to pre-finished surfaces.

D. Do not store where ambient temperature exceeds 120 degrees F (49 degrees C).

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not deliver materials or begin installation until building is enclosed, with complete protection from outside weather, and building temperature maintained at a minimum of 60 degrees F (15.6 degrees C).

1.7 WARRANTY

A. Manufacturers Standard Warranty: Provide warranty for Stainless Steel Material: Against corrosion or discoloration for 5 years, assuming proper maintenance according to manufacturer's recommendations.

1.8 COORDINATION

A. Coordinate Work with placement of support framing and anchors in walls and ceilings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ASI Global Partitions

B. Pre-approved equals

2.2 COMPARTMENTS AND SCREENS

A. Toilet Compartments: Ceiling hung.
   1. Compartment Depth and Width: As scheduled and indicated on Drawings.
   2. Door Width: 24 inches (610 mm), minimum; at ADA accessible compartments 36 inches (915 mm) minimum.
   3. Height Above Floor: 12 inches (305 mm).
   4. Door/Panel Height: 58 inches (1473 mm).

B. Privacy and Urinal Screens: Wall hung.
   1. Screen Panel Size: 24 inches (610 mm) wide by 48 inches (1219 mm) high.
   2. Height Above Floor: 12 inches (305 mm) for 48 inches (1219 mm) high.

2.3 STAINLESS STEEL TOILET COMPARTMENTS

A. Doors, Panels, Screens, and Pilasters: Tension leveled stainless steel face sheet with number 4 finish, bonded under pressure to honeycomb core with non-toxic adhesive.
   1. Doors, Screens, and Panels: 1 inch (25 mm) thick, 22 gage (0.793 mm) steel.
   2. Pilasters: Ceiling Hung, 1-1/4 inches (32 mm) thick, 18 gage (1.27 mm) steel.
   3. Edge Moldings: Continuous roll-formed, interlocking 22 gage (0.793 mm) steel crown molding, welded and ground smooth at corners.
   4. Finish: Type 304 stainless steel No. 4 Satin finish.

B. Door Hardware:
   1. Finish: Chromium plated Zamac attached with theft resistant barrel nuts and shoulder screws.
   2. Hinges: Top hinge recessed and interlocked in door, with nylon pin in the plane of the door, through-bolted. Bottom hinge recessed in door, with mating box and pintle nylon cams providing the bearing surface; adjustable to allow door to rest at any position within a 270-degree range; through-bolted.
   3. Strike and Keeper: With concealed latch assembly and provisions for external emergency access.
   4. Handicapped Access: ADA paddle handles on doors.
   5. Coat Hook and Bumper: Manufacturer's standard surface mounted. Tamper-resistant screws.
   6. Door Pull: Standard on ADA compartments. Two per ADA door.
   7. Fastening Hardware: Theft resistant heads.

C. Mounting Brackets: Chromium plated Zamac stirrup brackets with theft resistant screws.

D. Pilaster Shoes: Type 304 Stainless Steel, No. 4 satin finish. Minimum 4 inches (102 mm) high secured to floor w/internal clips for ceiling hung, floor to ceiling and floor mounted. For floor mounted overhead braced the shoe shall be 3 inches (76 mm) high.

E. Pilaster Anchors: Ceiling Hung.
   1. 0.116 inches (2.9 mm) slotted stirrup bracket welded to top of pilaster, with two 3/8-inch (9.5 mm) diameter cadmium-plated studs anchoring bracket to structure overhead.
   2. Concealed by pilaster shoe after installation.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions. Clean surfaces thoroughly

prior to installation.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
   1. Verify dimensions of areas to receive compartments.
   2. Verify locations of built-in framing, anchorage, bracing, and plumbing fixtures.

3.2 INSTALLATION

A. Install in accordance with approved shop drawings and manufacturer's instructions.

B. Fasten components to adjacent materials and to other components using purpose-designed fastening devices.

C. Adjust pilaster anchors for substrate variations; conceal anchors with pilaster shoes.

D. Equip each compartment door with hinges and door latch.

E. Install door strike keeper on pilasters in alignment with door latch.

F. Equip each compartment door with one coat hook and bumper.

G. Installation Tolerances:
   1. Maximum variations from plumb or level: 1/8 inch (3 mm).
   2. Clearance between wall surface and panels or pilasters: 1-1/2 inch (38 mm) maximum.

H. Provide any and all blocking and structural support as required to facilitate installation.

3.3 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors.

B. Adjust adjacent components for consistency of line or plane.

3.4 PROTECTION

A. Protect installed products until completion of project.

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

C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before substantial completion.

SECTION 10425 – SIGNAGE & PLAQUES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. See Rough & Finish Carpentry Section for additional information related to the fabrication of Signage comprised of wood.

C. See Electrical drawings and specifications for illuminated signage

1.02 SUMMARY

A. This Section includes the following types of signs:

(1) Unframed Panel Signs
(2) Plaques

B. Illuminated exit signs are specified in a Division 16 section.

C. Project sign is specified in Section 1B “Temporary Facilities”

1.03 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division Specification Sections.

B. Product Data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles and finishes.

C. Shop Drawings showing fabrication and erection of signs. Include plans, elevations and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories and installation details.

(1) Provide message list for each sign required, including large-scale details of wording and lettering layout. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

(2) Furnish full-size rubbings for metal plaques.

D. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

E. Submit samples of each sign form of color, pattern, and texture as selected from manufacturer’s standard colors and with requirements indicated:

(1) Panels & Frames: Provide a sample panel not less than 4 inches by 4 inches for

each material, color, texture and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style and colors and finishes of letters, numbers, and other graphic devices.

(4) Aluminum: Provide samples of each finish type and color, on not less than 4 inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

(5) Fiberglass/Acrylic: Provide samples of each finish type and color on 4 inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

(7) Plaque: Provide samples of each finish type and color required, showing letter style, color, and material finish on 4" square minimum.

1.04 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and may be based on the specific types and models indicated. Sign units by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept as judged by the Architect.

D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

(1) Manufacturers of Unframed Panel Signs:
Allenite, A Division of Allen Marking Products, Inc.
Andco Industries Corp.
Best Manufacturing Co.
Simmons Signs & Graphics

(2) Manufacturers of Metal Plaques and Dimensional Letters:
Andco Industries Corp.
Matthews International Corp.
Metal Arts
Simmons Signs & Graphics

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2.02 MATERIALS

A. Unframed Interior Panel Signs: 1/8” th. Aluminum sheet over 1/8” th. Aluminum sheet painted.

(1) Edge Condition: Square cut
(2) Corner Condition: Square corners
(3) Letter Style: By Architect
(4) Text, Symbols, and Grade 2 Braille: Raised 1/32" minimum.
(5) Laser cut letters/graphics as indicated

B. Exterior Panel Signs: 1/4” th. Aluminum sheet/bar stock over 1/4” th. Aluminum sheet painted.

(1) Edge Condition: Square cut
(2) Corner Condition: As shown
(3) Letter Style: By Architect
(4) Applied dimensional letters as indicated
(5) Laser cut letters/graphics as indicated

B. Aluminum Castings: Provide aluminum castings of F-214 alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.

C. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION

A. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

(1) Edge Condition: Square cut.

(2) Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16" measured diagonally.

2.04 GRAPHIC IMAGE PROCESS

A. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices.

B. Raised Copy: 1/32" high machine-cut text, graphics, and border. Produce precisely formed characters with square cut edges free from burrs and cut marks. No adhesive-mounted (applied) text, graphics or borders will be accepted.

2.05 DIMENSIONAL LETTERS AND NUMBERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting or laser cutting. Produce characters with smooth, flat faces, sharp corners, and precisely formed

lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

(1) Metal: Aluminum and Acrylic
(2) Letter Height: as indicated on drawings
(3) Letter Style: Architect to select from manufacturer's standard styles.
(4) Finish & Color: By Architect

2.07 CAST METAL PLAQUES

A. Cast Metal Plaques: Fabricate cast metal plaques to comply with requirements specified for metal, border style, background texture and finish and to comply with requirements shown for thickness, size, shape and copy. Produce castings free from pits, scale, sand, holes or other defects. Hand tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to "Finish" article for other finish requirements.

(1) Metal: Aluminum
(2) Border: Raised flat band, as indicated on Drawings.
(3) Background Texture: Manufacturer's standard dark leatherette finish.
(4) Finish: Two coats of clear acrylic lacquer.
(5) Size: Approximately 15" high x 18" wide.
(6) Text: To be furnished by Architect - 300 letters maximum per Plaque or as shown.
(7) Letter Style: By Architect
(8) One required

2.09 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

(1) Clear II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; chemical finish: Fine matte etched finish; anodic coating: Class II Architectural, clear film thicker than 0.4 mil).

(2) Clear II Clear Anodized Medium Satin Finish: AA-M31C22A31 (Mechanical Finish: Fine satin directional textured; chemical finish: medium matte etched finish; anodic coating: Class II Architectural, clear film thicker than 0.4 mil).

(3) Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other non-directional textured; chemical finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; organic coating: as specified below). Apply baked enamel in compliance with paint manufacturer's

specifications for cleaning, conversion coating and painting.

(4) Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.

(1) Color: Manufacturer's standard finish in custom color as selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Locate sign units and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.

(1) Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Unframed Panel Signs: Attach panel signs to surfaces using the methods indicated below:

(1) Vinyl Tape Mounting: Use double-sided foam tape, of the thickness indicated, to mount signs to smooth, non-porous surfaces. Do not use this method for vinyl covered or rough surfaces.

C. Cast Metal Plaques: Mount cast plaques using the standard method recommended by the plaque manufacturer for the type of wall surface indicated.

(1) Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes with quick-setting cement.

D. Dimensional Letters: Mount letters using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners. Contact Architect for visual inspection of template placement prior to installation.

(1) Flush Mounting: Equal to Metal Arts Method "FMM-1" or "FMM-2", for mounting to face brick wall.
(2) Free Standing Mounting: Equal to Metal Arts Method "PMS-3" (or as appropriate for mounting to a steel tube), for mounting to powder coated steel tube. Letters shall be held 1½" off face of tube with studs encompassed by spacers of like material to letters.

3.02 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.03 SCHEDULE OF SIGNAGE

A. As indicated on Drawings.

END OF SECTION 10425

SECTION 10522 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Install one type 2A extinguisher in Concession as located by Architect

B. Definition: "Fire Extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.

B. Types of products required include:

(1) Fire extinguishers (provide two as required)

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this section from one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating and classification of extinguisher indicated.

1.04 SUBMITTALS

A. Product Data: Submit product data for each type of product included in this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

- Amerex Corporation.
- J.L. Industries
- Larsen's Mfg. Co.
- Watrous, Inc.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

(1) Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.

B. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in red enameled steel container, for Class A, Class B and Class C fires.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Prepare recessed in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

END OF SECTION 10522

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ground Set Aluminum Flagpoles and Accessories

B. Related Sections:

1. Section 03 30 00 (03300) - Cast-in-Place Concrete: For concrete footings for flagpoles, ifany, and if not specified in this Section.
2. Div. 26 (16) Section for Exterior Lighting

1.02 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to the building code in effect for this Project or NAAMM FP 1001, "Guide Specifications for Design Loads of Metal Flagpoles," whichever is more stringent.
2. Base flagpole design on maximum standard-size flag suitable for use with pole or flag size indicated, whichever is more stringent.

1.03 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) with thefollowing supporting data:

1. Product Data: For each type of flagpole required. Include installation instructions.
2. Shop Drawings: Show general layout, jointing, grounding method, and anchoring and supporting systems. Include details of foundation system for ground-set poles.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each flagpole as a complete unit from a single manufacturer,including fittings, accessories, bases, and anchorage devices.

B. Certify that pole will withstand 90 mph winds with 8' x 12' flag.

C. Design Data:

1. The engineering design of the flagpole foundation is the manufacturer’s responsibility. Submit design analysis calculations.
2. Shop drawings and calculations shall be signed and stamped by a structural engineer licensed in the state where project is located.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy kraft paper or other weathertight wrapping andenclose in a hard fiber tube or other protective container.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. ACME Flagpole Co.
2. Baartol Co., Inc.
1. Concord Industries, Inc.
2. Eder Flagpole Co.
3. Ewing Flagpoles
4. American Flagpole, Inc.
5. Michigan Flagpole, Inc.

2.02 FLAGPOLES

A. Pole Construction, General: Construct poles and ship to Project site in one piece, if possible. If more than one piece is necessary, provide snug-fitting precision joints with self-aligning, internal splicing sleeve arrangement for weathertight, hairline field joints.

1. Provide the following above grade nominal heights, in locations shown on drawings.

a. 30 feet high

B. Aluminum Flagpoles: Fabricate from seamless, extruded tubing complying with ASTM B241 alloy 6063, with a minimum wall thickness of 3/16 inch. Heat treat after fabrication to comply with ASTM B597, temper T6.

1. Provide cone-tapered aluminum flagpoles.

C. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.0635" minimum wall thickness, sized to suit flagpole and installation. Provide with 3/16" steel bottom plate and support plate; 3/4" diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

2.03 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, 5" to 6" diameter, gold anodized.

B. Internal Halyard: Ball-bearing, nonfouling, revolving truck assemblies of cast metal with continuous 5/16" (8 mm) diameter, braided polypropylene halyards and 9" cast-metal cleats with fasteners.

1. Provide one halyard and one cleat at each flagpole.
2. Provide halyard protectors consisting of a 2" (50 mm) channel, 60" (1500 mm) long,finished to match flagpole.

C. Halyard Flag Snaps: Provide 2 swivel snap hooks per halyard.

D. Winch: Stainless steel, direct drive, self-locking.

E. Lightning Rod: 3/4" diameter galvanized lightning spike welded to base steel plate.

2.04 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements of Division 03 Section "Cast-in-Place Concrete" with 28- day compressive strength of not less than 3000 psi, complying with ASTM C 94.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish: Clear anodized AA-M32C22A41 and waxed.

2.06 FLAGS

A. Provide (2) 3’x5’ flags and required accessories for each pole. One American and one State of Alabama. Each shall be made in America and meet federal standards of fabrication.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare in-ground flagpoles by painting below-grade portions with a heavy coat of bituminous paint.

B. Excavation: For foundation, excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure forms, foundation tube, fiberglass sleeve, or anchor bolts in position, braced to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than 7 days or use a nonstaining curing compound. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, anduniform in texture and appearance. Provide positive slope for water runoff to base perimeter.

3.02 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood edges. Seal top of foundation tube with a 2" layer of elastomeric sealant and cover with flashing collar.

END OF SECTION

SECTION 10801 - TOILET ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of each toilet and bath accessory is indicated and scheduled on Drawings.

B. Types of toilet and bath accessories required include the following:

(1) Toilet tissue dispensers
(2) Soap Dispensers
(3) Mirrors
(4) Grab bars
(5) Sanitary Napkin disposal

C. See “Schedule of Toilet Accessories” on Drawings.

1.03 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

Bobrick Washroom Equipment, Inc.
Bradley Corporation

B. In order to establish a standard of design and quality, catalog numbers on Drawings refer to Bobrick and Bradley products. Equal items by above manufacturers will be accepted, subject to ten (10) day prior approval.

2.02 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished or satin finish, 22 gage (.34") minimum as indicated.

B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.40") minimum, unless otherwise indicated, Surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A 527, G60.

D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 SPECIFIC TOILET ACCESSORIES

A. Provide all accessories as indicated at "Toilet Accessories Schedule", on Drawings.

2.04 FABRICATION

A. General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

(1) Provide concealed wood blocking in drywall partitions as required for anchoring

of accessories.

3.02 ADJUSTING AND CLEANING

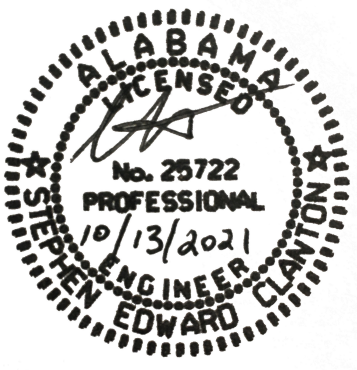
A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION 10801

Gadsden, AL Sports Park Phase B
Specifications

SECTION 15000 - GENERAL PROVISIONS
SECTION 15140 - SUPPORTS AND ANCHORS
SECTION 15256 – INSULATION FOR CONDENSATE DRAINS
SECTION 15258 – DUCTWORK INSULATION
SECTION 15264 – INSULATION FOR PLUMBING SYSTEMS
SECTION 15268 – INSULATION FOR REFRIGERANT PIPING
SECTION 15400 – PLUMBING SYSTEM
SECTION 15504 – REFRIGERANT PIPING SYSTEMS
SECTION 15505 – CONDENSATE DRAIN PIPING SYSTEMS
SECTION 15682 – AIR COOLED SPLIT SYSTEM HEAT PUMPS
SECTION 15981 – TESTING, ADJUSTING, AND BALANCING



SECTION 15000
GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this Section.

1.02 SCOPE OF WORK

A. The Work shall include the furnishings of systems, equipment, and materials specified in this Division and as required by Contract Documents to include: supervision, operation, methods, and labor for the fabrication, installation, start-up, and tests for the complete mechanical installation.

B. Drawings for the Work are diagrammatic, intended to convey the scope of the Work and to indicate the general arrangement and locations of the Work. Because of the scale of the Drawings, certain basic items such as pipe fittings, access panels, and sleeves may not be shown. This Contractor shall be responsible for selecting the equipment to fit the space provided. The location and sizes for ductwork, pipe fittings, sleeves, inserts, and other basic items required by code and other sections shall be coordinated and included for the proper installation of the work.

C. Equipment Specification may not deal individually with minute items required such as components, parts, controls, and devices which may be required to produce the equipment performance specified or as required to meet the equipment warranties. Where such items are required, they shall be included by the supplier of the equipment, whether or not specifically called for in the Contract Documents.

D. Where the words "provide", "furnish", "include", or "install" are used in the Specification or on the Drawings, it shall mean to furnish, install, and test complete and ready for operation, the items mentioned. If an item is indicated in the Contract Documents, it shall be considered sufficient for including same in the work.

E. Where noted on the Drawings or where called for in other Sections of the Project Manual, the Contractor for this Division shall install equipment furnished by Others, and shall make required service connections. Contractor shall verify with the supplier of the equipment the requirements for the installation.

F. Coordinate with all trades in submittal of shop drawings. Shop drawings shall be prepared clearly indicating all applicable components. Space conditions shall be

detailed to the satisfaction of all concerned trades, subject to review and final acceptance by the Engineer. In the event that the Contractor installs his work before coordinating with other trades or so as to cause any interference with work of other trades, the necessary changes shall be made in the work to correct the condition, at no additional cost to the Owner.

G. Mechanical, Plumbing and Fire Protection contractors are responsible for all items required for a complete working system. Contractors are responsible for contacting engineer on any items that may be unclear before bidding on the project. Contractors will be responsible for all items that they are unclear about if they bid without contacting engineer for clarification.

1.03 CODES AND STANDARDS

A. Conform to latest edition of governing codes, ordinances, or regulations of city, county, state, or utility company having jurisdiction. Where local codes are not applicable, conform to Standard Plumbing Code; Standard Mechanical Code; Standard Gas Code, Standard Fire Prevention Code and National Electrical Code.

1.04 CONTRACTOR'S QUALIFICATIONS

A. The qualifications of the Mechanical Contractor for this project shall be as follows:

1. The Contractor shall have been in the mechanical contracting business for the last five (5) consecutive years and under their current corporation name with essentially the same corporate officers.

2. The Contractor shall have successfully completed as least two projects of comparable size and scope.

3. The contractor shall be located within 60 miles driving distance of the project.

4. When requested, the contractor shall provide substantiating proof of these requirements.

1.05 FEES, PERMITS, AND INSPECTIONS

A. Secure all permits and pay all fees required in connection with the Work.

B. Coordinate and provide such inspections as are required by the Authorities with jurisdiction over the site.

C. Where applications are required for procuring of services to the building, prepare and file such application with the Utility Company. Furnish all information

required in connection with the application in the form required by the Utility Company.

D. Observations by the Engineer are as follows:

1. HVAC Observations:

A. Preliminary above ceiling observation.

B. Above ceiling observation.

C. Preliminary final observation.

D. Final observation.

Note: The preliminary observations are for locating items that need to be addressed before the above ceiling & final observations. If the engineer has to return for any re-observation, the contractor will be charged an hourly rate of $80.00/hr for the re-observation. It is the responsibility of the contractor to call the engineer for all preliminary and final observations.

2. Plumbing/Fire Protection Observations:

A. Underground observation of the sanitary sewer shall be done. This inspection will be done when the underground system has been installed and the required test as called for in Specifications Section 15400: Item 3.04 Testing; has been installed. If the required test has not been installed at the time that the plumbing contractor calls for the underground observation, the plumbing contractor shall pay the engineer an hourly rate of $80.00/hr for re-observation of the underground test.

B. All domestic water pipes shall be observed prior to being insulated or covered up and shall be tested per required test as called for in Specifications Section 15400: Item 3.04 Testing. If the required test has not been installed as required when the plumbing contractor calls the engineer for the test observation, the plumbing contractor shall pay the engineer an hourly rate of $80.00/hr for re-observation of the test.

C. All fire protection pipes shall be observed prior to being covered up and shall be tested per required test as called for in Specifications Section 15300: Item 3.01 General. If the required test has not been installed as required when the fire protection contractor calls the engineer for the test observation, the fire protection contractor shall pay the engineer an hourly rate of $80.00/hr for re-observation of the test.

D. Preliminary above ceiling observation.

E. Above ceiling observation.

F. Preliminary final observation.

G. Final observation.

Note: The preliminary observations are for locating items that need to be addressed before the above ceiling & final observations. If the engineer has to return for any re-observation, the contractor will be charged an hourly rate of $80.00/hr for the re-observation. It is the responsibility of the contractor to call the engineer for all preliminary and final observations.

1.06 ACTIVE SERVICES

A. Existing active services; water, gas, sewer, electric, are to be located and shall be protected against damage. Do not prevent or disturb operation of active services, which are to remain. If active services are encountered which require relocation, make request to authorities with jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the Utility or Municipality having jurisdiction.

1.07 SITE INSPECTION

A. Contractor shall inspect the site to familiarize himself with conditions of the site which will affect his work and shall verify points of connection with utilities, routing of outside piping to include required clearances from any existing structures, trees or other obstacles.

B. Extra payment will not be allowed for changes in the Work required because of Contractor's failure to make this inspection.

1.08 OPENINGS, CUTTING, AND PATCHING

A. Coordinate the placing of openings in the new structure as required for the installation of the Mechanical Work.

B. When additional patching is required due to failure to inspect work; then provide the patching required to properly close the openings, to include patch painting.

C. When cutting and patching of the structure is made necessary due to failure to install piping, ducts, sleeves, or equipment on schedule, or due to failure to furnish, on schedule, the information required for the leaving of openings, then provide the cutting and patching as required.

1.09 WIRING FOR MECHANICAL EQUIPMENT

A. Division 16 shall provide power services for motors and equipment furnished by this Contractor to include safety disconnect switches, starters and final connections.

B. Division 15 shall provide all motors and contactors for equipment furnished under this Division, except where they are an integral part of a motor control center which is provided under another Division.

C. Provide internal wiring, alarm wiring including for fire protection and/or security, control wiring, and interlock wiring for equipment furnished, to include temperature control wiring.

D. Coordinate with Division 16 all motors and other mechanical equipment, which require electrical services. Provide schedule, which shall include the exact location for rough-in, electrical load, size, and electrical characteristics for all services required.

E. Where motors or equipment furnished require larger services or services of different electrical characteristics than those called for on the Electrical Drawings, this contractor shall coordinate with the electrical contractor and the Electrical Engineer to provide a larger service as required, the cost of which shall be the responsibility of this contractor.

F. Electrical work provided under Division 15 shall conform to the requirements of Division 16.

1.10 SUBSTITUTIONS

A. Substitutions for the scheduled and specified equipment shall only be done with the prior approval of the engineer, and shall be obtained in writing. Prior approvals shall be obtained no less than one week prior to the bid date. Prior approval shall not relieve the contractor of supplying equipment that meets the specifications, capacities, efficiencies, physical dimensions, etc.

1.11 PROTECTION

A. Special care shall be taken for the protection of equipment furnished. Equipment and material shall be completely protected from weather elements, painting, plaster, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition.

B. Where the installation or connection of equipment requires work in areas previously finished by other Contractors, the area shall be protected and not

marred, soiled, or otherwise damaged during the course of such work. Contractor shall arrange with the other Contractors for repairing and refinishing of such areas, which may be damaged.

C. When welding is required inside building, provide one man for a fire watch. Fire watch shall require adequate protection of existing surfaces and observance of lower floors where penetrations exist.

1.12 SUBMITTALS

A. General

1. Submit to Architect/Engineer shop drawings and product data required by the drawings and specifications.

2. Contractor shall compile all data including but not limited to ductwork materials and construction details, ductwork layout, manufacturers catalog and product data, controls wiring diagrams and material data, piping, insulation, water treatment, and test and balance.

3. Submit a minimum of 7 copies of data, more if required by the Architect.

B. Submittal Requirements

1. Prepare submittals compiled in a 3 ring, hard bound, loose leaf binder. The face of the binder shall be clearly marked with the project title and number, the name of the Owner, Architect, Engineer, General Contractor and this contractor.

2. The first page inside the binder shall provide an index, numerically indicating all sections applicable to this submittal.

3. Separate binders shall be provided for HVAC, plumbing and fire protection trades.

4. Provide tab dividers for each section submitted. In the event an item appears on the drawings not specifically covered by the specifications, provide an additional numeric tab at the end of the index detailing the item and include the submittal data in the binder.

5. All equipment included on the submittal sheets shall be marked to indicate the “Tag” name or number of the equipment as shown on the drawings. The equipment shall be high-lighted, where necessary, to clarify which items are being submitted.

6. For the ductwork submittals, the contractor will be provided with an electronic copy of the mechanical floor plans. Ductwork layout submittals shall consist of two paper copies and one copy on a reproducible medium such as Mylar. The reproducible copy shall be returned to the contractor with the engineer's approval stamp and comments.

7. Submit only complete project submittals. Partial submittals or submittals not complying with the above requirements shall be returned to the contractor un-marked and rejected.

8. In the interest of project expediency the contractor may pre-submit long lead items for pre-approval. However, the contractor shall not be relieved of including the same data as required by submittal binder and shall be included therein.

9. The Contractor may turn in submittals without control drawings if they require a longer production time. All other items shall be included.

10. Provide a tab for items not included and include an explanation of why item is not included in the submittal and the expected submittal date.

11. Review shop drawings and product data prior to submission to Architect/Engineer.

12. Verify field measurements, field construction criteria, catalog numbers, and similar data.

13. Coordinate each submittal with work of the project and Contract Documents.

14. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect/Engineer's review of submittals, unless Architect/Engineer gives written acceptance of specific deviations.

15. Notify Architect/Engineer in writing of deviations from requirements of Contract Documents at time submittals are made. A "deviation" shall be construed to mean a minor change to the sequence indicated on drawings or specification. A "deviation" is not intended to allow substitutions or product options.

16. Do not begin work, which requires submittals until submittals have been returned with Architect/Engineer's stamp and initials or signature indicating review and approval. Materials and equipment that were installed prior to being not approved shall be removed and replaced with approved items at no additional cost to other parties.

17. Shop Drawings and/or submittals requiring resubmission to the Architect/Engineer due to non-compliance with the Contract Documents and/or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Architect/Engineer for review. The Contractor shall ensure the completeness and compliance of the submittal materials and shall reimburse the Architect/Engineer at their standard hourly billing rates for review of submittals/shop drawings beyond the second submission. The Engineer will hold the submittals until such compensation has been satisfied. The engineering hourly rate for reviewing re-submittals shall be $80.00/hr.

18. Attention is directed to the fact that Architect/Engineer's review is only to check for general conformance with the design concept of the project and general compliance with Contract Documents. No responsibility is assumed by Architect/ Engineer for correctness of dimensions, details, quantities, and procedures shown on shop drawings or submittals.

19. Omission in shop drawings of any materials indicated in Contract Drawings, mentioned in Specifications, or required for proper execution and completion of Work, does not relieve the Contractor from responsibility for providing such materials.

20. Approval of a separate or specified item does not necessarily constitute approval of an assembly in which item functions.

1.13 OPERATING AND MAINTENANCE MANUALS

A. General

1. Provide three up-to-date copies of shop drawings, product data, and other information described in this Section for use in compiling operating and maintenance manuals.

2. Provide legible submittals made by permanent reproduction copy equipment from typewritten or typeset originals.

3. Pre-punch 8-1/2 inch x 11 inch sheets for standard three ring binders.

4. Submit larger sheets in rolled and protected packages.

B. Compilation

1. The Contractor will receive shop drawings, brochures, materials lists, technical data of all types, warranties, guarantees, and other pertinent

information and will assemble, catalog, and file information in loose-leaf, hardback three-ring binders.

2. Submittal Format: (Provide each of the following items, as applicable, for each required item or system. Requirements will vary, depending on the equipment. Refer to specific Specification section requirements.)

   a. Item: (Use appropriate Section title.)

   b. System Description: (Provide a detailed narrative description of each system, describing function, components, capacities, controls and other data specified, and including the following:

      (1.) Number of.

      (2.) Sizes.

      (3.) Type of operation.

      (4.) Detailed operating instructions, including start-up and shut-down of each system, with indications for position of all controls, as applicable.

      (5.) Wiring Diagrams: (Complete wiring diagrams for internally wired components including controls.)

      (6.) Operating Sequence: (Describe in detail.)

      (7.) Manufacturers Data: (Provide catalog data sheets, specifications, nameplate data and parts list.)

      (8.) Preventative Maintenance: (Provide manufacturer's detailed maintenance recommendations.)

      (9.) Trouble Shooting: (Provide manufacturer's sequence for trouble-shooting procedures for operational problems.)

      (10.) Extra Parts: (Provide a listing of extra stock parts furnished as part of the Contract.)

      (11.) Warranties: (Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins, date of expiration, and name, address and telephone number of person to contact regarding problems during warranty period.)

(12.) Directory: (Provide names, addresses and telephone numbers of Contractor, its subcontractors, suppliers, installers and authorized service and parts suppliers. Format as follows:)
Contractor:
Address:
Telephone No.:
Person to Contact:

Subcontractor:
Address:
Telephone No.:
Person to Contact:

Installer:
Address:
Telephone No.:
Person to Contact:

Manufacturer:
Address:
Telephone No.:
Person to Contact:

Local Service Representative:
Address:
Telephone No.:
Person to Contact:

1.14 RECORD DRAWINGS

A. Detailed Requirements for Record Drawings

1. During the progress of the work, the Contractor shall require the job superintendent for the plumbing, air conditioning, heating, ventilating, and fire protection subcontractors to record on their field sets of drawings the exact locations, as installed, of all conduits, pipes, and ducts whether concealed or exposed which were not installed exactly as shown on the contract drawings.

2. Upon completion of the work this data shall be recorded to scale, by a competent draftsman on sepia line prints or transparent paper of the contract drawings. Sepia will be furnished to the Contractor by the Architect/Engineer, but cost shall be borne by Contractor. Where changes are to be recorded, the sepia line prints shall be erased before the changes are made. Where the work was installed exactly as shown on the contract

drawings the sepia line prints shall not be disturbed other than being marked "As-Built". In showing the changes the same legend shall be used to identify piping, etc., as was used on the contract drawings. A separate set of drawings shall be prepared for plumbing, heating, air conditioning, and ventilating work unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the subcontractor submitting the drawings.

3. The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the sepia drawings are accurate and truly represent the work as actually installed. Where plumbing, hot or chilled water pipes, inverts etc., are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project. The sepia line prints including those unchanged and changed shall be submitted to the Architect/Engineer.

4. The Contractor shall submit as-built drawings to the Architect/Engineer for review.

5. The Engineer shall authorize the Contractor to produce and distribute the as-built drawings as follows:

   a. One (1) blue line to the Engineer.

   b. One (1) blue line to the Architect.

   c. One (1) sepia to the Owner.

1.15 SUBSTITUTIONS AND PRODUCT OPTIONS

A. For products specified only by reference standard, select product meeting that standard, by any manufacturer.

B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with specifications.

C. For products specified by naming several products or manufacturers and stating "or equivalent", "or equal", or "or Architect/Engineer approved equivalent", or similar wording, submit a request for proposed substitutions for any product or manufacturer which is not specifically named; for review and approval by the Engineer.

D. For products specified by naming only one product and manufacturer, there may be an option of an Engineer approval of a product of equal or greater quality or size.

1.16 SUBSTITUTION SUBMISSIONS

A. Contractor's Base Bid shall be per contract documents.

B. Submit separate request for each substitution. Support each request with:

1. Complete data substantiating compliance of proposed substitution with requirements stated in contract documents:

a. Product identification, including manufacturer's name and address.

b. Manufacturer's literature; identify:

(1.) Product description.

(2.) Reference standards.

(3.) Performance and test data.

c. Name and address of at least two similar projects on which product has been used, and date of each installation.

d. Itemized comparison of the proposed substitution with product specified; list significant variations.

e. Data relating to changes in construction schedule.

f. Any effect of substitution on separate contracts.

g. List of changes required in other work or products.

h. Designation of availability of maintenance services, sources of replacement materials.

i. Provide certification of product compatibility with adjacent materials.

C. Substitutions will not be considered for acceptance when:

1. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor or his supplier prior to bid.

2. Acceptance will require substantial revision of contract documents.

3. In judgement of Engineer, do not include adequate information necessary for a complete evaluation.

4. Substitute products shall not be ordered or installed without written acceptance of Engineer.

5. Architect/Engineer will determine acceptability of proposed substitutions.

1.17 CONTRACTOR'S SUBSTITUTION RESPONSIBILITIES

A. In making formal request for substitution, Contractor represents that:

1. He has investigated proposed product and has determined that it is equivalent to or superior in all respects to that specified.

2. He will provide same warranties or bonds for substitution as for product specified.

3. He will coordinate installation of accepted substitution into the work, and will make such changes as may be required for the work to be complete in all respects. This includes revisions due to changes in electrical characteristics, physical size and weight, service requirements, service clearances, etc.

4. He waives claims for additional costs caused by substitution, which may subsequently become apparent.

B. The contractor shall have included all costs associated with the substitution for the specified products or materials, and that no additional cost will be incurred by any other party in order to fully incorporate the substituted item(s).

C. The contractor agrees to reimburse the Architect/Engineer for any architectural or engineering re-design that is required by the substitution to be fully incorporated. The reimbursement shall be at the Architect/Engineer’s standard billing rate.

1.18 ARCHITECT/ENGINEER DUTIES

A. Review Contractor's requests for substitutions with reasonable promptness.

B. Notify Contractor in writing of decision to accept or reject requested substitution.

1.19 FINISHING

A. General: Prior to acceptance of the installation and final payment of the Contract, the Contractor shall perform the work outlined herein.

B. Cleaning: At the conclusion of the construction, the site and structure shall be cleaned thoroughly of all debris and unused materials remaining from the mechanical construction. All closed off spaces shall be cleaned of all packing boxes, wood frame members, and other waste materials used in the mechanical construction.

C. The entire system of piping and equipment shall be cleaned internally. The Contractor shall open all dirt pockets and strainers, completely blowing down as required and clean strainer screens of all accumulated debris.

D. All tanks, fixtures, and pumps shall be drained and proven free of sludge and accumulated matter.

E. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.). All HVAC equipment shall have affixed adjacent to the permanent nameplate, the unit identification on an engraved label with permanent adhesive.

F. Heating and air conditioning equipment, tanks, pumps, etc., shall be thoroughly cleaned and new filters or filter media installed.

1.20 TEST AND DEMONSTRATIONS

A. Systems shall be tested and placed in proper working order prior to demonstrating systems to Owner.

B. Prior to acceptance of the mechanical installation, demonstrate to the Owner or his designated representatives all essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems. The contract shall allow for five (5) working days to perform the demonstrations.

C. Provide necessary trained personnel to perform the demonstrations and instructions. Provide manufacturer's representatives for systems as required to assist with the demonstrations.

D. Dates and times for performing the demonstrations shall be coordinated with the Owner.

E. Upon completion of demonstrations, provide a certificate testifying that demonstrations have been completed. Certificate shall list each system demonstrated, dates demonstrations were performed, names of parties in attendance, and shall bear signatures of contractor and owner.

1.21 PAINTING AND IDENTIFICATION

A. Touch-up paint where damaged on equipment furnished with factory applied finish, to match original finish.

B. Provide engraved, laminated plastic tags for all equipment. Tags shall be attached with permanent adhesive.

1.22 EXCAVATING, TRENCHING, AND BACKFILLING

A. Provide excavation necessary for underground water piping, etc., and backfill such trenches and excavations after work has been installed and tested. Care shall be taken in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing. Where a line must pass under footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavation shall be kept free form water by pumping if necessary. No greater length of trench shall be left open, in advance of pipe and utility laying, than that which is authorized.

B. Trenches for piping and utilities located inside foundation walls and to point five (5) feet outside of the wall shall be not less than sixteen (16) inches nor more than twenty-four (24) inches wider than the outside diameter of the pipe to be laid. The widths of trenches for piping and utilities located more than five (5) feet outside of building foundation walls, other than for sewers, shall be governed by conditions found at the site.

C. Bottoms of trenches shall be so shaped that when pipe is in place the lower fourth of the circumference for the full length of the barrel will be supported on compacted fill. Bell holes shall be dug so that no part of the weight of the pipe is supported by the bell but shall be no larger than necessary for proper jointing. All sewers and piping required for the structure shall be excavated to at least (6) inches below pipe invert.

D. Immediately after testing and/or inspection, the trench shall be carefully backfilled with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly puddled and tamped in such a manner as not to disturb the alignment or joints of the pipe. Thereafter, the backfill shall be puddled and tamped every vertical foot.

1.23 CONCRETE WORK

A. Provide concrete bases and housekeeping pads for mechanical equipment unless indicated otherwise. Concrete work shall be as specified in the applicable Civil/Site and Structural Sections. Vibration pads, equipment bases, pipe supports and thrust blocks shall be provided by this Contractor.

B. Provide equipment anchor bolts and coordinate their proper installation and accurate location.

1.24 ACCESS PANELS

A. Provide access panels where required and not shown on the drawings for installation by the drywall Contractor. Access panels shall be as specified in the applicable architectural section. All access panel locations which allow access to mechanical equipment shall be approved by the Architect/Engineer.

1.25 SLEEVES

A. Sleeves passing through non-load bearing or non-fire rated walls and partitions shall be galvanized sheet steel with lock seam joints of minimum gauges as follows: for pipes 2-1/2" size and smaller - 24 gauge; 3" to 6" - 22 gauge.

B. Sleeves passing through load bearing walls, concrete beams, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe or cast iron pipe.

C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.

D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions, and ceilings, and shall extend 1/2" above finished floors. Extend sleeves 1" above finished floors in areas likely to entrap water.

E. Pipe to wall penetration closures for underground pipe penetrations of walls shall be "Link-Seal" as manufactured by Thunderline Corporation, or equal.

1.26 ESCUTCHEONS

A. Provide chrome plated escutcheons at each sleeved opening into finished and exposed exterior spaces. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve. Where sleeve extends above finished floor, escutcheon shall be high cap type and shall clear sleeve extension. Secure escutcheons or plates to sleeve but not to insulation with set screws or other approved devices.

1.27 INSULATION PROTECTION

A. Where exposed insulated piping extends to floor, provide sheet metal guard around insulation.

1.28 ANCHORING OF EQUIPMENT

A. All equipment located on floor slab, that is not mounted on wheels and is capable of being moved shall be secured to the floor with anchor bolts. A minimum of two bolts are required per each piece of equipment and bolts shall be of sufficient size to prevent equipment from overturning.

1.29 PROTECTION OF ELECTRICAL EQUIPMENT

A. Water piping shall not be installed in electrical rooms or directly above electrical equipment.

1.30 CONNECTIONS FOR FIXTURES AND EQUIPMENT UNDER ANOTHER SECTION OR BY OWNER

A. Rough all equipment requiring connection to systems provided under this Division. Verify requirements and current locations before proceeding with work.

B. Make all connections to equipment furnished under another Section or by owner as required to obtain complete and working systems.

1.31 SYSTEM GUARANTEE

A. Work required under this Division shall include one-year guarantee. Guarantee by Contractor to Owner to replace for Owner any defective workmanship or material which has been furnished under contract at no cost to the Owner for a period of one year from date of acceptance of systems. Guarantee shall also include all reasonable adjustments of system required for proper operation during guarantee period. Guarantee shall not include normal preventative maintenance services or filters.

B. At "Demonstration", one-year guarantee provision by Contractor shall be explained to Owner.

C. All sealed hermetic refrigeration systems shall be provided with five-year factory warranty.

END OF SECTION

SECTION 15140
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe, duct, and equipment hangers, supports, and associated anchors.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.02 SUBMITTALS

A. Submit shop drawings and product data for all items listed under this section.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 4 inches: Carbon steel, adjustable, clevis.

B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

C. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

D. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

E. Vertical Support: Steel riser clamp.

F. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

G. Un-insulated Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

H. Shield for Insulated Piping 1 1/4 Inches and Smaller: 18 gage galvanized steel saddle over insulation in 180 degree segments, minimum 12 inches long per pipe support.

I. Shield for Insulated Water Piping 1 1/2 Inches and Larger: Rigid non-conducting blocking in 180 degree segments, 12 inch minimum length with block thickness the same as insulation thickness and with an inner contour of the supporting pipe. Install with 18 gage galvanized steel saddle per pipe support.

K. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.02 HANGER RODS

A. Steel Hanger Rods: Galvanized threaded both ends, threaded one end, or continuously threaded.

2.03 FLASHING

A. Metal Flashing: galvanized steel.

B. Lead Flashing: 5 lb/sq ft sheet lead for waterproofing; one lb/sq ft sheet lead for soundproofing.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

2.04 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with schedule 80 PVC or Schedule 10 steel pipe.

B. Sleeves for Pipes Through Non-fire Rated Walls, Footings, and Potentially Wet Floors: Form with schedule 10 steel pipe.

C. Sleeves through beams shall be Schedule 40 steel; only in locations approved by the Structural Engineer.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Flanges shall be 20 gage galvanized steel.

F. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 15160.

2.05 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

2.06 FINISH

A. Prime coat steel hangers and supports.

PART 3 - EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
PVC (All Sizes)	6'-0"	3/8"
C.I. Bell and Spigot (or No-Hub) and at joints	5'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. All hangers, hanger rods, supports, etc. shall be double nutted.

3.02 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete type.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.03 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor, and mop sink drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

3.04 SLEEVES

A. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

B. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 15256
INSULATION FOR CONDENSATE DRAINS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work of this section shall include providing the thermal insulation for mechanical systems and shall include the following principal items:

1. Condensate Drains

B. This work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of five years.

1.02 SUBMITTALS

A. Submittals and product literature for each insulation type, finish type and equipment served, shall be required. Provide submittals on method of installation for each type of insulation used.

B. Product samples and installation samples are required and shall be provided at the discretion of the engineer.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

2.02 INSULATION TYPES

A. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing. Equal to Armaflex AP 2000.

B. Closed cell, elastomeric thermal insulation tape. Commonly supplied in 2" X 1/8" thick. Equal to Armaflex insulation tape.

2.03 ADHESIVES

A. An air drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000 in specification section 2.02-A. Comply with Mil Spec. Mil-A-24179A and Amend-2 as type 11, class 1. Equal to Armstrong 520 adhesive.

2.04 FINISHES

A. A white, elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel. Equal to WB Armaflex finish.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by Workmen skilled in this trade. Unsightly work shall be cause for rejection.

B. Mechanical fasteners shall be used whenever possible to assure permanent construction.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and three times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 GA, 180-degree, galvanized sheet metal saddles same length as block supports.

E. All insulation of cold surfaces shall be vapor sealed. All joints, laps, breaks, and faults in vapor barriers of insulations covering cold surfaces shall be thoroughly sealed.

F. Insulation that becomes wet for any reason shall be removed, replaced, and resealed at the expense of this Contractor.

G. Piping systems requiring tests to be witnessed by the Architect shall not be insulated until such systems have been tested and approved.

3.02 APPLICATION

A. Condensate drain insulation

1. Insulation shall be butted together and adhered in place with joint adhesive (see Part 2, 2.03, A). All joints and seams shall be sealed with contact adhesive. Where possible insulation shall be slipped on without slitting. Insulation shall be butted firmly to equipment. Short radius elbows shall be mitered, adhesive applied and firmly held together until the adhesive hardens sufficiently to prevent separation.

2. Provide removable sections of insulation at all clean outs.

3. Paint all exposed insulation with Armaflex white paint (see Part 2, 2.04, A).

4. Provide sheet metal saddles for all insulated condensate piping at pipe supports.

3.02 INSULATION THICKNESS

A. Provide 1/2" thick insulation materials for all condensate piping.

3.03 MISCELLANEOUS

A. This contractor will contact the engineer at the start of all phases of work, as follows:

1. During installation of any concealed insulation.

2. During installation of above ceiling insulation work.

B. The engineer will ascertain the continuation of work subject to the requirements.

END OF SECTION

SECTION 15258
DUCTWORK INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work of this section shall include providing the thermal insulation for mechanical systems and shall include the following principal items:

1. Supply ductwork.
2. Return ductwork.
3. Outside Air ductwork.
4. Relief Air ductwork.
5. Exhaust Air ductwork.

B. Not all the insulation types specified herein may be required on this project. The contractor is only to provide those insulation types required for the applications on this project.

C. This work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of five years.

1.02 SUBMITTALS

A. Submittals and product literature for each insulation type, finish type, and equipment served. Provide submittals on method of installation for each type of insulation used.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

B. Insulation Types:

1. FIBERGLASS BLANKET

Made of flame - attenuated glass fibers, bonded with a thermosetting resin. Reinforced with fiberglass scrim facing laminated to UL rated kraft. FSK facing, .02 perms, .00035" foil thickness per ASTM E-96, procedure A. 3" thick, 3/4 lb., 10.7 R value. Equal to Manville, Microlite.

2. DUCT LINER

Acoustical and thermal insulation manufactured from long textile, type glass fibers firmly bonded together with a thermosetting resin. Air stream surface is coated to protect against air erosion. Up to 250 degrees F (ASTM C 411), NFPA 90A and 90B, ASTM C 1071: not greater than 0.5% moisture by volume at 120 degrees F and 96% RH. Equal to Certainteed 1" thick, type 150, .28 K value for up to 2,500 FPM velocity. Liner not to support mold or mildew growth.

C. Weather Barrier Mastics

1. An emulsion type material compounded of selected and processed bitumens and mineral fillers. Equal to INSULKOTE ET. and INSULKOTE PRIMER E.

D. Duct Tape

1. FSK, glass fiber impregnated with foil facing, 4"wide, 25/50, ASTM E-84.

E. Adhesives

1. Water based adhesives for attaching low density fibrous insulation and duct liner to metal. Service temperature limits-20 degrees F to 250 degrees F, UL MJAT-2, ASTM C 916, type 11, NFDA 90A and 90B. Equal to Foster Quick Tack Adhesive 85-60. Adhesive not to support mold or mildew growth.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by Workmen skilled in this trade. Unsightly work shall be cause for rejection.

B. Mechanical fasteners shall be used whenever possible to assure permanent construction.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. All insulation of cold surfaces shall be vapor sealed. All joints, laps, breaks, and faults in vapor barriers of insulation covering cold surfaces shall be thoroughly sealed.

E. Insulation that becomes wet for any reason shall be removed, replaced, and resealed at the expense of this Contractor.

F. All ductwork shall be sealed during construction until final connection to negate any type of debris from getting into ductwork and on insulation. This includes but not limited to wood dust, sheetrock dust, etc.

3.02 APPLICATION

A. Duct sizes are base off net free area.

B. Supply and return ducts located in interior unconditioned spaces shall have an insulation rating of no less than R-6.

C. Supply and return ducts located in exterior areas shall have an insulation rating of no less than R-8.

D. Exterior wrap insulation shall have a vapor barrier.

E. Supply and Return Ductwork Indicated on the Plans to be Lined.

Use DUCT LINER (Part 2, 2.01, C-5), (Part 2, 2.01, B-5 or B-6), and (Part 2, 2.01, E-1). Liner shall be attached to metal using adhesive covering 90% of the metal. All edges of liner facing the direction of airflow and not receiving metal nosing shall be coated with adhesive. Liner shall be neatly butted without gaps at transverse joints and shall be coated with adhesive at such joints.

Liner shall be folded and compressed in the corners of rectangular duct sections or shall be cut and fit to assure butted edge overlapping. Longitudinal joints in duct liner shall not occur except at the corners of ducts unless the size of the duct and standard liner product dimensions make such necessary.

Interior widths of duct not exceeding 8" do not require mechanical fasteners in addition to adhesive.

Interior widths of duct exceeding 8" will require mechanical fasteners as follows:

Velocity	Transversely Around Perimeter	Longitudinally
2500 fpm dn	At 4" from corners and at	At 3" from transverse joints

	intervals not exceeding 12"	and at intervals not exceeding 18"
2501 fpm to 6000 fpm	At 3"from corners and at intervals not exceeding 6"	At 3" from transverse joints and at intervals not exceeding 16"

Mechanical fasteners will be applied with an approved mechanical fastening system. Hand driven pins with hammers will not be approved. Weld pins or "Grip Nails" or equal.

Longitudinal joints in liner shall be coated with adhesive at velocities over 2500 fpm.

Metal nosing that are either channel or zee profile or are integrally formed from the duct wall shall be securely installed over transversely oriented liner edges facing the airstream at fan discharge and at any interval of lined duct preceded by unlined duct. In addition, where velocities exceed 4000 fpm metal nosing shall be used on upstream edges of liner at every transverse joint.

Where dampers, turning vane assemblies or other devices are placed inside of lined duct or fittings, the installation must not damage the liner or cause erosion of the liner. The use of metal hat sections or other buildout means is optional; when used, buildouts shall be secured to the duct wall with bolts, screws, rivets or welds.

Ductwork indicated to be lined shall be lined accordingly:

1. Up to 2,500 FPM velocity (Part 2, 2.01, B-5)

2. 2,500 FPM to 6,000 FPM velocity (Part 2, 2.01, B-6)

3.03 MISCELLANEOUS

A. Ductwork indicated on the drawings to be internally lined shall not be insulated externally unless the ductwork is outside of the building insulation envelope.

B. All insulating systems described herein shall conform to the latest edition of SMACNA and will comply with NFPA-90A, 90B, 30; TIMA AHC-101; ASTM C390, C167, C553, E84, C177, C423, C411, C916, D903, D93, D1151; ASHRAE; ACGIH; Tested for UL 181.

C. The engineer will reserve the right to accept or reject any and all work not in

compliance with the aforementioned. The engineer will be contacted for inspection during any of the following operations:

1. During installation of any ductwork wrapping.

2. During the installation of ductwork that has been lined.

END OF SECTION

SECTION 15264
INSULATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work of this section shall include the thermal insulation for the following plumbing systems that may or may not be present on this project:

1. Rain Leaders and/or Emergency Rain Leaders
2. Traps, trap arms, cold and hot water supplies
3. Traps on condensate receiving floor drains above grade
4. Equipment
5. Hot water piping below grade
6. Domestic cold water, domestic hot water, hot water recirculating and non-potable water

B. This work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of five years.

1.02 SUBMITTALS

A. Provide submittals consisting of product literature for each insulation type, finish type and equipment served. Provide submittals on method of installation for each type of insulation used.

B. Product samples and installation samples are required and shall be provided at the discretion of the engineer. Samples may include but are not limited to, 90º Ells, 45º Ells, valves, and sections of pipe.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with ASTM E-84, NFPA 255 and UL 723. All material shall be finished with surfaces having a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 and under ASTM E-84.

B. Interior piping Rigid Fiberglass - .23K Factor, 3# density, minimum R Factor 4.3 suitable for 0ºF, flame spread rating 25, maximum smoke developed rating 50. Equal to Owens Corning - Fiberglass ASJ/S1-11.

C. Interior fittings on 1/2- and 3/4-inch pipes and accessories may use job built mitered

fittings of similar material as piping. Valves and fittings 1 inch and up will use molded preformed fiberglass fittings sized for the fitting or device being insulated. All fittings and devices being insulated shall be covered with a preformed, white, snap-on type, molded PVC jacket cover. Stainless steel tack fasteners hold the cover together at the overlapping throat seam. Matching white, pressure sensitive tape seals and finishes the fitting and adjacent pipe insulation joint. Equal to Certainteed Snap Form Fitting System.

D. Above ground exterior piping shall be equal to Foamglass - .33K factor suitable for 900ºF, 8.5 # density per square foot. Equal to Pittsburgh Corning - Strata - Fab system with ASJ jacket.

E. Fittings for above ground exterior piping shall be machine formed, routed and fitted for specific size fitting and of same material as in D.

F. Below ground exterior piping shall be of same materials as D except without ASJ jacket.

G. Below ground exterior fittings shall be of same material as in D except without ASJ jacket.

H. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing, equal to Armaflex AP 2000.

I Closed cell, flexible elastomeric thermal sheet insulation, 1/2 inch thick, black in color.

J. Semi-rigid fiberglass board, 3 lb density, thermal conductivity compliance ASTM C 165, 650ºF temperature limit, 1 1/2" thick. High temperature fiberglass bonded to a flexible jacketing. Jacketing is to be laminated of white Kraft and aluminum foil, reinforced with fiberglass, chemically treated for fire and smoke safety. Equal to Manville Pipe and Tank insulation.

2.02 INSULATION FINISH MATERIALS

A. White all Service Jacket (ASJ).

B. Glass fabric equal to Foster Mast-A-Fab.

C. Smooth Aluminum 0.016-inch thickness and 0.032-inch thickness for exterior use. Equal to Pabco.

D. Aluminum fittings for elbows, tees and devices, precision formed, smooth and mar-free finish, 0.024 inches thick. Equal to Pabco.

E. Roofing Felt, 15 lb.

F. Black asphaltic cutback mastic for underground or outdoor use. Equal to Foster C.I. Mastic 60-25.

2.03 ADHESIVES

A. An air-drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000 in Specification Section 2-2.01 I. Equal to Armstrong 520 Adhesive.

2.04 FINISHES

A. A white elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel; equal to WB Armaflex Finish.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by workmen skilled in this trade. Unsightly work shall be cause for rejection.

B. Mechanical fasteners shall be used whenever possible to assure permanent construction.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and three times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 GA, 180-degree, galvanized sheet metal saddles same length as block supports.

E. All insulation of cold surfaces shall be vapor sealed. All joints, laps, breaks, and faults in vapor barriers of insulations covering cold surfaces, shall be thoroughly sealed.

F. Insulation that becomes wet for any reason shall be removed, replaced, and resealed at the expense of this Contractor.

G. Piping systems requiring testing to be witnessed by the Engineer shall not be insulated until such systems have been tested and approved.

H. Do not insulate any moving parts, valve handles, expansion tanks or backflow preventers.

3.02 APPLICATION

A. Insulation application schedule

NOMINAL PIPE SIZE	INTERIOR	EXTERIOR ABOVE GRADE	BELOW GRADE/SLAB
1/2" - 1"	1"	1"	1"
1 1/4" - 2 ½"	1"	1 1/2"	1"
3" and above	1 1/2"	2"	1 1/2"

B. Rigid Fiberglass Insulation
For interior domestic cold, hot & recirculating

1. Piping
All insulation shall be butted together and securely stapled in place with outward clinching staples on 3" centers. Factory provided laps of 4" wide ASJ tape of same type as jacket on insulation shall be used on butt joints as per (Part 2-2.01-B)

2. Fittings
Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation as per (Part 2-2.01-C).

C. Rain Leaders and/or Emergency Rain Leaders

1. Insulation Thickness Schedule

NOMINAL PIPE SIZE	EXPOSED CONDITIONED SPACE	EXPOSED NON-CONDITIONED SPACE	CONCEALED WITHIN BLDG. INSULATION	CONCEALED OUTSIDE BUILDING INSULATION
3" and 4"	1"	1"	1 1/2"	2"
6" to 10"	1"	1 1/2"	1"	2"
12" to 16"	1 1/2"	2"	1 1/2"	2 1/2"
18" to 24"	2"	2 1/2"	2"	2 1/2"

2. Rain leaders and emergency rain leaders are to be completely insulated including all portions of horizontal and vertical piping. Insulation will continue up to the roof drain hub joint. The roof drain hub and pan and any area surrounding the roof drain exposed shall be insulated by this contractor.

3. Piping
All insulation shall be butted together and securely stapled in place with outward clinching staples on 3" centers. Factory provided laps of 4" wide ASJ tape of same type as jacket on insulation shall be used on butt joints as per (Part 2-2.01-B).

4. Fittings
Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation as per (Part 2-2.01-C).

5. Roof drain hubs and pans to be insulated per (Part 2-2.01-I) Miter cut the insulation to fit and glue into place.

6. At ends of pipe insulation, bevel the insulation 30 degrees and seal with two coats Childers CP-30.

D. Traps on condensate receiving floor drains above grade.

1. Wrap traps on hub and floor drains per (Part 2-2.01 I). Insulation shall be cut and formed to the contours of the hub and wrapped around pipe. Factory adhesive shall be used to seal the mitered joints and connection.

E. Storage tanks

1. Hot water storage tanks shall be wrapped with semi-rigid fiberglass board as per (Part 2-2.01 J). Wrap the insulation around the tank to verify the length to be joined for an overlap. Cut the insulation and strip off a 3" wide strip for the overlap. Wrap the insulation around the tank and verify that the insulation is butted. Attach the 3" wide overlap with outward clinching staples spaced 3 inches O.C. Cut neatly for all penetrations and seal off any tears, joints or staples with ASJ jacket tape of same materials.

F. Hot water piping below grade

1. Underground hot water pipe and fitting shall use the following schedule of sizes (see Part 3-3.02 A).

2. Provide Foamglass insulation for underground hot water piping as per (Part 2-2.01 F). Underground piping insulation shall be applied over a clean dry surface. Provide 22 gage galvanized wire at 12" O.C. Cover impregnated felt and stagger joints at midpoint. Apply sealant at joints, laps and seams.

Secure felt with wire at 12" O.C. with 22 gage galvanized wire. Apply tack coat over felt at not less than 4 gal. per 100 square feet. Embed cloth membrane into wet tack coat. Smooth membrane to avoid wrinkles and overlap seams at least 2". Apply a finish coat at 8 gallons per 100 square feet making certain that membrane is fully covered. Allow 8 hours of drying time before any piping is covered.

3. Underground fittings shall be installed as described above. Provide materials as per (Part 2-2.01 G).

G. Cold, hot water, hot water re-circulating and non-potable water piping above exterior grade exposed and concealed.

1. Above grade exterior cold and hot water shall be insulated with Foamglass as per (Part 2-2.01 D). Fittings shall be as in (Part 2-2.01 E).

2. Piping
All insulation shall be applied over a clean dry surface. Factory provided laps of 4" wide ASJ tape of same type as jacket on insulation shall be used on butt joints. All laps and penetrations shall be sealed with a vapor barrier mastic finish.

3. Fittings
Fitting insulation shall be covered with two coats of vapor barrier mastic with an intermediate layer of glass fabric.

4. All above grade exterior piping shall be covered with aluminum jacketing. Aluminum shall be applied to a clean dry surface. Overlap butt joints 4" and apply 1/2" wide bands of aluminum on 8" O.C. and at each end of fittings. On exterior piping, the longitudinal seam shall be located at the bottom center of piping and turned 1/4" down for a drip edge. All joints on exterior piping shall be made watertight with suitable silicone caulking. Caulking is to be applied to joints prior to bands being installed.

H. All interior exposed piping and fittings located in manufacturing areas, mechanical rooms, etc. below 8'0" AFF shall be wrapped with aluminum jacketing as per (Part 2-2.02 C and D). Provide 1/2" wide aluminum bands located at a maximum of 8" O.C.

3.03 MISCELLANEOUS

A. This contractor will contact the engineer prior to start of all phases of work as follows:

1. Installation of underground insulation.

2. Exterior above grade installation.

3. Interior insulation installation.

B. The engineer will ascertain the continuation of work subject to the requirements.

END OF SECTION

SECTION 15268
INSULATION FOR REFRIGERANT PIPING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work of this section shall include providing the thermal insulation for mechanical systems and shall include the following principal items:

Refrigerant Suction Line

B. This work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of five years.

1.02 SUBMITTALS

A. Submittals and product literature for each insulation type, finish type and equipment served, shall be required. Provide submittals on method of installation for each type of insulation used.

B. Product samples and installation samples are required and shall be provided at the discretion of the engineer.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

2.02 INSULATION TYPES

A. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing. Equal to Armaflex AP 2000.

B. Closed cell, elastomeric thermal insulation tape. Commonly supplied in 2" X 1/8" thick. Equal to Armaflex insulation tape.

2.03 ADHESIVES

A. An air-drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000 in specification section 2.02-A. Equal to Armstrong 520 adhesive.

2.04 FINISHES

A. A white, elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel. Equal to WB Armaflex finish.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by Workmen skilled in this trade. Unsightly work shall be cause for rejection.

B. Mechanical fasteners shall be used whenever possible to assure permanent construction.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and three times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 GA, 180-degree, galvanized sheet metal saddles same length as block supports.

E. All insulation of cold surfaces shall be vapor sealed. All joints, laps, breaks, and faults in vapor barriers of insulations covering cold surfaces shall be thoroughly sealed.

F. Insulation that becomes wet for any reason shall be removed, replaced, and resealed at the expense of this Contractor.

G. Piping systems requiring tests to be witnessed by the Architect shall not be insulated until such systems have been tested and approved.

3.02 APPLICATION

A. Insulation shall be butted together and adhered in place with joint adhesive (see Part 2, 2.03, A). All joints and seams shall be sealed with contact adhesive. Where possible insulation shall be slipped on without slitting. Insulation shall be butted firmly to equipment. Short radius elbows shall be mitered, adhesive applied and firmly held together until the adhesive hardens sufficiently to prevent separation.

B. Paint all exposed insulation with Armaflex white paint (see Part 2, 2.04, A).

C. Provide sheet metal saddles for all insulated refrigerant piping at pipe supports.

3.03 INSULATION THICKNESS

A. Provide 3/4" thick insulation materials for all refrigerant suction line piping.

3.04 MISCELLANEOUS

A. This contractor will contact the engineer at the start of all phases of work, as follows:

1. During installation of any concealed insulation.

2. During installation of above ceiling insulation work.

B. The engineer will ascertain the continuation of work subject to the requirements.

END OF SECTION

SECTION 15400
PLUMBING SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The following described work, materials and equipment shall be furnished and installed as shown on the Drawings and as herein specified.

1. All plumbing fixtures, accessories and trims as shown on the Drawings and as herein specified.

2. Domestic water service, specialties and piping to all fixtures and equipment.

3. All sanitary sewer piping and equipment shown throughout the building and extension to the sanitary sewer as indicated on the Civil Drawings.

1.02 REFERENCES

A. All plumbing installation and fabrication shall be in accordance with applicable State and Local Plumbing Codes.

1.03 SUBMITTALS

A. Submit catalog data and shop drawings for all materials and equipment listed under this section and per basic mechanical requirements. Include submittal data on related specifications also.

B. Materials, fixtures, or equipment installed without review or after rejection shall be replaced by this contractor with acceptable items at the Engineer's direction.

C. All materials, equipment, and appliances shall be new, without defect, first line quality unless specifically noted or specified otherwise.

D. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application involved.

E. Contractor further agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the engineer, the design drawings and specifications shall control and be followed.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. General: Provide all plumbing fixtures complete with trim required and connect in a manner conforming to the local Building Code. Certain fixtures may be furnished by others under other sections of these Specifications. Provide rough-in and final connections including all valves, traps, specialties, etc. required.

B. Provide traps for all waste connections where not furnished with the equipment and stop cocks or valved shut-offs for all water connections to all sinks and other items of equipment. Stainless steel bell escutcheons shall be installed covering the hub connections below sinks and lavatories and extend to the wall or back of cabinet for a tight fit.

C. Quality and Type of Fixtures:

1. Plumbing fixtures are specified by manufacture and model numbers for the purpose of establishing type and quality. Manufacturer listed is design basis. Provide “Engineer Approved” products with similar documented performance, construction and characteristics. Equal fixtures as manufactured by Kohler, Delta, Eljer, Halsey Taylor, Crane, Smith, Just, or Zurn will be considered.

2. Carriers are specified by Smith catalog numbers to establish quality, type and supporting capacities only. Carriers of equal quality, type and supporting capacities as manufactured by Zurn, Josam or Wade will be considered. Carrier assemblies, risers, and plates to be enameled finish.

3. Floor drains are to be supplied with a metallic cover plate, formed, and drilled to fit in place of the strainer for the duration of construction. Upon completion of construction and before final inspection, the new strainer shall be installed. Any strainers installed during construction that have an accumulation of construction debris, concrete, mortar, etc., will be replaced with new strainers.

2.02 DOMESTIC WATER PIPING SYSTEM

A. Buried, Exterior:

1. Copper Pipe, 3 1/2" and smaller: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: Lead-free, tin-silver solder.

2. Ductile Iron Pipe (D.I.P.), 4" and larger: Cement lined, per ANSI/AWWA C151/A21.51.
Joints: Shall be push on or mechanical type as indicated on drawings.

3. Schedule 40 PVC to within 5’-0” of building.

4. PEX piping.

B. Buried Below Slab:

1. Copper Pipe: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: All joints below slab shall be hard temper with brazed joints.

2. Copper pipe, primer drains: Type K hard drawn copper per ASTM B-88. Joints to be with an approved lead-free, tin-silver solder.

3. PEX piping.

C. Above Grade:

1. Copper Pipe: Type L hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: Lead-free, tin-silver solder.

2. PEX piping.

Note: Mechanically formed TEE connections will be allowed on hard drawn copper only. Joints must be brazed in accordance with the copper development association copper tube handbook using B-cup series filler metal, and manufacturing recommendations.

D. All solder joints shall be soldered with an approved listed solder. Acid core solder shall not be used.

2.03 DOMESTIC WATER SPECIALTIES

A. Water Hammer Arrestors (SA): ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300 degrees F; 5000 Series as manufactured by J.R. Smith; Zurn, Josam, Wade or equal.

2.04 SANITARY SEWER PIPING SYSTEM

A. Buried, Exterior:

1. Cast Iron Pipe: ASTM A-74 spun service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN 74 compression type with ASTM C-564 neoprene gaskets.

2. PVC Pipe: Schedule 40 per ASTM D-1785. Fittings: PVC per ASTM D-2466.

Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.

B. Buried, Interior:

1. Cast Iron Pipe: ASTM A-74 spun service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN 74 compression type with ASTM C-564 neoprene gaskets.

2. PVC Pipe: Schedule 40 per ASTM D-1785. Fittings: PVC per ASTM D-2466. Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.

Notes:
This contractor shall provide/install cast iron pipe at all fire rated assemblies and return air plenums. This contractor shall coordinate with Architectural and Mechanical drawings.

Waste and vent piping installed inside a turned down slab condition at the building perimeter or at column footings shall be cast iron pipe. PVC may be used in the remainder of the areas. Coordinate with the Architectural and Structural drawings for locations.

Where neither condition occurs, PVC may be used.

2.05 SANITARY SEWER SPECIALTIES

A. Cleanouts: Cleanouts shall be the same nominal size as the pipe served up to 4" and not less than 4" for line sizes greater than 4". Cleanouts shall be as specified in Section 2.01 Plumbing Fixtures.

2.06 P & T RELIEF PIPING

A. Above Slab:

1. Copper Pipe: Type L hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: Lead-free, tin-silver solder.

PART 3 - EXECUTION

3.01 GENERAL

A. Obtain exact centerline rough-in dimensions between partitions or walls from the Architectural Drawings. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets. Water supplies shall connect through walls with stops and chrome plated escutcheons with setscrews. Where fixtures are

without supporting legs or carriers secure wall hangers to bolts welded to 3/16" steel plates, mounted against walls within chases.

B. Where backs of fixtures join wainscoting or tile, they shall be ground flat and the joints made close. Run bead of white caulking compound around back of fixture at outside edge before final setting. When fixture is set, wipe compound so that joint is sealed. Remove excess compound with solvent. Caulking compound shall be Porter "Brilliant White", Pittsburgh Glass, Sherwin-Williams, or equal.

C. All rough-in sanitary sewer piping shall be properly plugged or capped in a manner approved by the Engineer.

D. Mount fixtures to the heights above finished floor as indicated on the Architectural drawings.

E. Upon completion of the water heater installation, the plumbing contractor shall arrange and pay for the State of Alabama Boiler and Pressure Vessel Safety Division Inspector to visit the job site to inspect the water heater installation. Furnish a written report of the inspector's findings and comply with all comments.

3.02 DOMESTIC WATER PIPING SYSTEM

A. Provide a complete system of domestic water piping including interior and exterior work as indicated.

B. Piping shall be accurately cut to measurements established at the project site, worked into place without springing or forcing, run as directly as possible, run parallel or perpendicular to building lines, located as indicated on the Drawings and supported as specified elsewhere. Parallel piping shall be grouped together as much as practical. Piping shall be supported as high as practical. Piping not located in mechanical rooms shall be concealed unless noted otherwise.

C. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.

D. Contractor shall provide for expansion and contraction of piping systems. Expansion and contraction of piping shall not impart excess stress or strain on the building, pipefittings, joints, or connections to equipment.

E. Piping shall be installed with sufficient spacing between fittings, valves, flanges, etc. to allow insulation fittings to be installed without trimming or modification.

F. Provide sleeves for all piping penetrations of grade beams, floors above grade and walls. Sleeves for insulated piping above grade shall be sized for the insulation

diameter. Annular space between the insulation and sleeve shall be sealed or fire caulked as detailed on the drawings. Sleeves for piping through walls below grade shall be sized for use of compressible rubber link seals unless noted otherwise.

G. Piping thru slabs on grade shall be protected with 1/2" thick closed cell flexible foam insulation minimum 6 inches above and below slab. Wrap all pipes below slab in an approved jacketing material or paint with two coats of a bituminous paint.

H. Piping installed below grade shall have a minimum of 24” cover. Pipes shall be coated with two coats of bituminous paint.

I. Provide solid type stainless steel escutcheon plates at each exposed piping penetration of walls and ceilings and inside cabinets at water and waste penetrations. Escutcheon plates for insulated piping shall be sized for the insulation diameter. Split ring escutcheons will not be allowed. Waste escutcheons inside cabinets or exposed below sinks or lavatories shall be bell type escutcheons sized to cover the hub and fit flush with wall.

J. All piping shall be installed to allow complete draining, slope as required. Provide drain valves at all low points where fixtures cannot be used to drain piping. Provide hose bibb with 3/4" hose connection, vacuum breaker/backflow preventer and service valve at the water main entrance.

K. Provide shutoff valves at each branch from main. Provide shutoff valves for each fixture group to minimize interruption of service for maintenance and repair. Provide an exterior main shutoff valve and valve box as indicated on drawings. Provide area shut-off valves as necessary to facilitate testing and isolation of piping where tested and approved pipes are put into service.

L. Piping thru metal studs shall be isolated from metal to metal contact with plastic bushings specifically designed for the application.

M. Provide water hammer arrestors where indicated on the drawings. Arrestors shall be sized for the fixture group installed on and shall be accessible for inspection and/or replacement, provide access panels as required.

N. All stubouts and exposed piping shall be rigidly supported to eliminate movement.

O. This Contractor shall complete all equipment connections to the domestic water piping system. Provide shutoff valves and unions for each connection.

P. Connections to water heaters and connections between ferrous and copper pipe shall be made with dielectric unions or flanges. Joints between plastic and metallic pipe shall be made with transition fittings for the specified purpose.

3.03 SANITARY SEWER PIPING SYSTEM

A. Provide a complete system of sanitary sewer drain, waste and vent piping including interior and exterior work as indicated.

B. Piping up to 3" shall be sloped at least ¼" inch per foot. Piping 4" and 6" shall be sloped at least 1/8 inch per foot. Piping 8" and larger shall be sloped at least 1/16 inch per foot. Piping below slabs shall not be sloped less than 1/8" per foot regardless of size.

C. Buried piping below slab and exterior of building perimeter shall be laid in minimum 4 inches of bedding below and 6" above pipe and sloped as specified herein. Bedding shall be accurately and uniformly graded. Bedding shall be crushed stone equal to Alabama Highway Department #9 crushed stone. Bedding shall be free of organic material. Backfill below floor slabs shall be No. 57 crushed stone full depth from top of bedding to bottom of slab.

D. Provide cleanouts as required by Code and as indicated on the Drawings. Cleanouts for piping 4" and smaller shall be line size. Cleanouts for piping 6" and larger shall be 4". Provide dual exterior cleanouts within 5 feet of building. Interior cleanouts in floors shall be flush with finished floors. Interior cleanouts in walls shall be above the flood level of plumbing fixtures. Exterior cleanouts in unpaved areas and areas paved with other than concrete shall be set in concrete pads flush with finished grade as detailed on the drawings.

E. Vents through roof shall be a minimum of 3 inches in diameter and shall terminate at least 12 inches above the roof. See plans for other sizes.

F. This Contractor shall be responsible for locating vents at least 10 feet from Outside Air intakes, offset vents as required.

G. Drainage piping shall be installed with hubs upstream of each pipe section. Provide reducing fittings where different sizes of pipe are to be connected. Bushings shall not be used. Provide longsweep fittings, sanitary tees, and combination wyes with 1/8 bends as applicable.

H. All rough-in soil, waste, vent, and storm piping shall be properly plugged or capped in a manner approved by the Engineer.

I. Escutcheons shall be provided on wall penetrations as indicated in 3.02, Domestic Water Piping System.

J. Interior wall cleanouts shall have stainless steel wall covers sized for the cleanout and covering the wall opening. Cleanout covers shall be installed flush with the wall.

3.04 TESTING

A. All piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.

B. Water piping systems shall be subjected to a hydrostatic test of one hundred twenty-five pounds minimum or 1 1/2 times operating pressure which ever is greater. The system shall be proven tight after a twenty-four (24) hour test. Air testing of piping will not be accepted by this engineer.

C. All rainwater leaders, soil waste and vent piping shall be subjected to a hydrostatic test of not less than a 10-foot head. Piping shall be tested for not less than 4 hours, prior to installing fixtures. Underground piping shall be tested before backfilling.

D. Provide test report in booklet form showing all field test performed to prove compliance with the specified performance criteria. Booklet shall be submitted prior to submitting for final payment. Booklet shall include the following

1. SYSTEM TESTED (sanitary) (domestic water) (rain leaders)
2. Date of test
3. Test medium
4. Persons present
5. Pressure tested
6. Lines tested ands location
7. Length of time test pressure was held
8. Pressure drop
9. Water pressure at most remote and highest location
10. Residual chlorine

E. This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests inspections have been made and approvals obtained. This Contractor shall notify the Engineer four days prior to testing to allow for scheduling.

3.05 STERILIZATION OF DOMESTIC WATER PIPING SYSTEM

A. Thoroughly flush for a minimum of two hours and then drain the domestic water piping prior to sterilizing by the following method or other methods satisfactory to the Engineer and the Authority Having Jurisdiction.

B. Fill piping with a solution containing 50 ppm of available chlorine. Open and close all valves to thoroughly distribute solution thru all piping. Allow solution to stand for 24 hours then test for residual chlorine at the ends of the lines. If less than 25 ppm is indicated, repeat the sterilization process. When tests show at least 25 ppm of residual chlorine, flush out the system until all traces of chlorine are removed. Open

and close all valves in system several times during flushing period.

C. The Engineer reserves the right to test the water again at any time prior to final acceptance of the work and if found to be unsafe bacteriologically, to require the Contractor to rechlorinate the system until the water is proven equal to that supplied by the public system.

D. Contractor shall arrange for laboratory testing for a bacteriological examination of potable water system at various locations. The samples shall be tested to meet requirement of city and shall not be of less quality than provided by city. Submit copy from testing agency prior to submitting for final payment.

E. Minor work such as repairs or replacement of single fitting or valve, pre-clean and disinfect by immersion in solution of 300 ppm chlorine for 1 hour.

3.06 CLEANING

A. At completion of all work, fixtures, exposed materials, and equipment shall be thoroughly cleaned.

B. All strainer screens shall be removed and cleaned.

3.07 FINAL ACCEPTANCE

A. Before final acceptance, the Plumbing Contractor shall furnish a certificate of inspection and final approval from the plumbing Inspector to the Owner and be in accordance with the latest revisions of the applicable codes and the Approved Plumbing Drawings and Specifications. Contractor shall also furnish booklet of test, sterilization compliance and backflow devices certificates.

END OF SECTION

SECTION 15504
REFRIGERANT PIPING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide refrigerant piping systems complete with all accessories as specified herein and/or as indicated on the Drawings.

B. Pressure test all refrigerant piping systems as specified herein.

1.02 REFERENCES

American National Standards Institute (ANSI)
American Society of Mechanical Engineers (ASME)
American Society of Testing and Materials (ASTM)

1.03 SUBMITTALS

A. Submit manufacturer's catalog data for all materials and equipment listed under this section.

PART 2 - PRODUCTS

2.01 PIPING

A. Refrigerant Piping shall be copper ACR tubing Type L hard drawn or Type K per ASTM B280 and shall be cleaned, dehydrated, charged with gaseous nitrogen and sealed. Fittings shall be forged or wrought copper. Joints shall be brazed silver.

2.02 ACCESSORIES

A. Filter/dryers in sizes 1/2" and larger shall be the full-flow, replaceable-core type. Sizes smaller than 1/2" shall be the sealed type. Cores shall be of a suitable desiccant that will not plug, cake, dust, channel, or break down but shall remove water, acid, and foreign material from the refrigerant. The dryer shall be constructed so that no desiccant will pass into the refrigerant lines. A filter/dryer shall be provided in the liquid line to each evaporator and shall be piped with two isolation valves. Pressure drop through the dryer shall not exceed 2 psi when operating at full-connected evaporator capacity.

B. Liquid Sight Glasses. Sight glasses shall be double glass, see-through type, with cover cap on each side. Sight glass shall be provided in liquid line immediately preceding each expansion valve. Glass shall be furnished with a color-change-

type moisture indicator.

C. Moisture Indicators. Color-change moisture indicators shall be provided downstream from each filter/dryer and bypass or shall be combined as a single unit in the liquid sight glasses.

D. Shutoff Valves. Shutoff valves shall be packless diaphragm (in sizes commercially available), with packed, ground-finish stem, key operated, back seating, sealed-cap type; otherwise, angle pattern valves shall be used whenever possible.

E. Solenoid Valves. Valves shall be brass or steel body, packless type, with corrosion-resistant steel trim, rated for continuous-duty service, direct-or pilot-operated, provided with manual lift stems, and designed for use with type of refrigerant used. The valve capacities shall be sufficient for the requirements of the installation at a pressure drop not more than 2 psi. Valves in suction lines shall be sized in accordance with temperature rise and superheat normal to the system.

F. Expansion Valves. Shall be thermal-expansion type to suit specific system refrigerant, designed to fit coil distributors, and capable of operating from 40 to 100 percent of full load at system head pressure without hunting or liquid hammer. Valves shall have external equalizer connections and external superheat adjustments with seal caps. Joint connections shall be mechanical threaded or flanged type. Valves shall require not over 4 degrees F. superheat change to move from fully open to fully closed position. Superheat setting shall be 10 degrees F. at full load. Expansion valves shall be balanced double seated or pilot operated, capable of stable operation at 15 percent design load. Each valve shall be provided with external strainer.

PART 3 - EXECUTION

3.01 GENERAL

A. Piping shall be accurately cut to measurements established at he project site, worked into place without springing or forcing, run as directly as possible, run parallel or perpendicular to building lines, located as indicated on the Drawings and supported as specified elsewhere. Parallel piping shall be grouped together as much as practical. Piping shall be supported as high as practical. Piping not located in mechanical rooms shall be concealed unless noted otherwise.

B. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.

C. Provide sleeves for all piping penetrations of floors and walls. Sleeves for

insulated piping above grade shall be sized for the insulation diameter.

D. Provide escutcheon plates at each exposed piping penetration of walls and ceilings. Escutcheon plates for insulated piping shall be sized for the insulation diameter.

3.02 REFRIGERANT PIPING SYSTEMS

A. Provide a complete refrigerant tubing system as indicated herein and on the Drawings.

B. All refrigerant piping shall be ACR Type L hard drawn tubing except for exposed piping in public areas which shall be ACR Type K tubing.

C. All refrigerant lines shall be sized in accordance with the equipment manufacturers recommendations. All piping shall be rigidly supported.

D. All elbows in refrigerant piping systems shall be long radius elbows.

E. Joints shall be silver brazed using a continuous flow of nitrogen inside the piping to prevent oxidation.

F. Provide filter driers, sight glasses, moisture indicators, shutoff valves, solenoid valves and expansion valves when not provided as standard or as an option on equipment. Components shall be specifically designed for refrigeration service.

H. Pressure test each piping system at 150 psig using dry nitrogen. Test each joint for leaks by spraying with soapy water. Joints that leak shall be disassembled, cleaned to bare copper and silver brazed again. Pressure test shall be repeated until all joints pass.

I. Vacuum test each piping system after pressure test is completed. Piping shall be drawn to 500 microns of HG and tested for 12 hours without additional pumping. If piping system fails vacuum test repeat pressure test.

J. Charge each piping system after vacuum test is completed. Charge each system per manufacturer's instructions. Halide torch test each joint after charging.

END OF SECTION

SECTION 15505
CONDENSATE DRAIN PIPING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide condensate drain piping systems complete with all accessories as specified herein and/or as indicated on the Drawings.

1.02 REFERENCES

American National Standards Institute (ANSI)
American Society of Mechanical Engineers (ASME)
American Society of Testing and Materials (ASTM)

1.03 SUBMITTALS

A. Submit manufacturer's catalog data for all materials and equipment listed under this section.

PART 2 - PRODUCT

1.04 PIPING

A. Condensate drain piping shall be SCH 40 PVC.

PART 3 - EXECUTION

3.01 GENERAL

A. Piping shall be accurately cut to measurements established at The project site, worked into place without springing or forcing, run as directly as possible, run parallel or perpendicular to building lines, located as indicated on the Drawings and supported as specified elsewhere. Parallel piping shall be grouped together as much as practical. Piping shall be supported as high as practical. Piping not located in mechanical rooms shall be concealed unless noted otherwise.

B. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.

C. Provide sleeves for all piping penetrations of floors and walls. Sleeves for insulated piping above grade shall be sized for the insulation diameter.

D. Provide escutcheon plates at each exposed piping penetration of walls and ceilings. Escutcheon plates for insulated piping shall be sized for the insulation diameter.

3.02 CONDENSATE DRAIN PIPING

A. Provide condensate drain trap with a depth at least one inch greater than the fan total static pressure as measured from the discharge invert to the trap obvert.

B. Provide a vent on the trap if the discharge height is ten feet or greater.

C. Slope piping at a uniform slope of at least 1/8” inch per foot to ensure proper drainage.

D. Condensate drain lines shall be adequately supported to prevent low points, which could cause double trapping.

E. Condensate drain lines indicated to be terminated at floor drains shall either be turned down through this floor drain grate or be provided an indirect waste funnel for the floor drain.

END OF SECTION

SECTION 15682
AIR COOLED SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work of this section consists of providing all material, labor and equipment necessary for the fabrication and installation of all equipment and appurtenances specified herein and as indicated on the drawings.

1. 1-5 ton single phase units.

B. Not all the equipment specified herein may be used on this project. Refer to schedules on drawings for equipment requirements.

C. All compressors shall have 5-year warranty.

1.02 SUBMITTALS

A. Submit catalog data, shop drawings and installation instructions prior to commencement of work for all materials and equipment incorporated into the drawings and specified herein.

PART 2 - PRODUCTS

2.01 1-5 Ton Single Phase Split System Heat Pumps

A. Units shall bear UL label and be certified in accordance with A.R.I. standards. Units shall be pre-charged and be pre-wired ready for final connections.

B. Fan discharge and unit arrangement shall be as indicated on the plans.

C. Units will feature the following as standard: Compressor crankcase heaters, compressor internal overload protection, O.D pressure taps for refrigerant pressure checks, refrigerant service valves and refrigerant filter dryer, electronic defrost control with defrost on demand, outdoor temperature sensor, switchover valve and head pressure control for low ambient operation.

D. Units will feature the following accessories: Outdoor low ambient to 0 degrees F, compressor time delay relay, high- and low-pressure protection and coil guards.

E. Mitsubishi units are specified to establish quality of equipment. Equal equipment by LG and Bryant will be considered.

PART 3 - EXECUTION

3.01 GENERAL

A. All equipment shall be installed in accordance with the recommendations of the manufacturer.

B. Refrigerant line sizes shall be determined in accordance with the manufacturer's recommendations. This contractor is responsible for any changes or accessories required due to the specific requirements of a particular manufacturer. All refrigerant lines shall be sized by the manufacturer and approved by the engineer prior to any work commencement.

C. Provide and install any accessories necessary for a complete and functioning system.

D. All condensers shall be set on 6" thick concrete slabs for on grade installations. For roof mounted condensers see mechanical prints for details.

END OF SECTION

SECTION 15981
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all labor, equipment and instrumentation necessary to perform the testing, adjusting and balancing (TAB) of heating, ventilating and air conditioning (HVAC) systems which shall include, but not be limited to:

1. Supply air systems
2. Return air systems (including plenum returns)
3. Exhaust air systems
4. Outside air
5. Mixed air
6. Adjustment of controls and equipment as required for proper operation of systems
7. Adjust all systems to maintain building pressure design

1.02 REFERENCES

A. Associated Air Balance Council (AABC)

B. National Environmental Balancing Bureau (NEBB)

C. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

D. Sheet Metal and Air Conditioning Contractor's Association (SMACNA)

1.03 THE TAB AGENDA

A. The TAB Agenda Contractor shall prepare a TAB agenda for review and approval by the Engineer. The TAB Agenda shall be provided during the submittal process. The TAB Contractor shall not commence work until the TAB Agenda has been approved by the Engineer.

B. The Agenda shall include the following detailed narrative procedures, system diagrams and forms for test results.

1. Specific standard procedures required and proposed for each system. Additional procedures for variable flow systems shall be developed by the TAB Contractor and included for review and approval.

2. Specific test forms for recording each TAB procedure and additional test forms for any variable flow systems shall be developed by the TAB Contractor and submitted for review and approval.

3. System diagrams for each air and water system. Diagrams may be single line. In addition to the information recorded for standard AABC or NEBB procedures, report the following information:

a. Package AC units: Prepare profile and show design and actual CFM (outside air, return air, supply air). Record pressure drops of all components (coils, filters, louvers, dampers, fans) and compare with design values. Pressure profile and component pressure drops are performance indicators and are not to be used for flow measurements. Record temperatures of outside air, return air, mixed air and supply air.

b. Duct distribution systems: Prepare pressure profiles from the air handling units to the extremities of the system. As a minimum, show pressures at each floor and, main branch. Make pitot tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Record residual pressures at inlet of volume controlled terminals at ends of system. Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

1.04 SUBMITTALS

A. The TAB Contractor shall submit the following items prior to commencing work. All submittals shall be bound in a binder complete with cover sheet, index, and tabs separating specific sections of the submittal.

1. The TAB agenda as detailed in paragraph 1.03-A

2. Warranty information

3. TAB Contractor qualifications including TAB Engineer and company experience on similar projects

4. Submit project supervisor and qualifications

5. Submit TAB equipment and last date of calibration

B. After completion of all TAB procedures and before warranty period commences, submit complete test reports as provided for by the prior approved TAB agenda, for Engineer review and approval. Where test results differ from specified design conditions, indicating a contract deficiency, include explanatory comments and possible resolutions in the report. After review by the Engineer, the TAB Contractor shall make any adjustments deemed necessary by the Engineer.

C. Final report shall be submitted for acceptance and record. Submit six (6) copies of final reports.

1.05 WARRANTY

A. For a period of one year after acceptance by the Owner, the TAB Contractor shall, at the request of the Engineer, return to the project to retest and/or rebalance any problem areas. This shall be done within ten (10) working days at no additional expense to the Owner or the Engineer. The purpose of this is to correct a problem, not to retest/rebalance revisions made by the Owner.

B. During the first year after acceptance by the Owner, the TAB Contractor shall return to the project during the peak heating and cooling seasons to rebalance the applicable hydronic systems to maintain the required discharge air and water temperatures. The T&B report shall be amended to reflect the results.

PART 2 - EQUIPMENT (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. The TAB Contractor shall review and become thoroughly familiar with the job site when the erection of the building is in the early stages. An additional visit shall be made when the rough-in is complete. Prior to any closing in of ductwork and piping, verify that all fittings, dampers, control devices and test devices are properly located and installed.

B. The TAB Contractor shall examine each air distribution system to verify that it is free from obstructions. The TAB Contractor shall determine that all dampers and registers are in a set or full open position; that moving equipment is lubricated; and that the required filters are clean and functioning. The TAB Contractor shall

request that the installing contractor perform air adjustments necessary for proper functioning of the system.

C. The TAB Contractor shall use test instruments that have been calibrated within a time period recommended by the manufacturer (no more than 6 months) and have been checked for accuracy prior of the start of the testing, adjusting and balancing.

D. The TAB Contractor shall verify that all equipment performs as designed and specified. The TAB Contractor shall adjust all variable type drives, volume dampers, control dampers, etc., as required by the TAB work.

E. Coordinate TAB procedures with all construction requirements for the project so that usable increments of finished work may be accepted for beneficial occupancy. Systems serving partially occupied phases of the project may require balancing for each phase prior to final balancing.

F. Allow sufficient time in construction schedule for TAB prior to final inspection for the project.

G. Conduct final TAB after system has been completed and is in full working order. Put all HVAC systems into full operation and continue operation of the systems during each working day of TAB. Accomplish TAB in accordance with the Agenda approved by the Engineer.

3.02 AIR BALANCE

A. Place all interactive systems in operation with all filters installed and automatic control systems completed and operating. Artificially load air filters by partial blanking or other means to produce air pressure drop midway between the clean and dirty condition. Set/reset room thermostats as necessary to check heating and cooling function, and maximum/minimum flow rates for factory set air terminal units and adjust units if not correct.

B. Balance systems to design ratings. Adjust fan speeds to provide design flows, including system diversities, at actual system pressures. Provide additional sheaves and belts as required to achieve design CFM.

C. Make pilot tube traverses of all trunk lines and major branches when required to determine proper proportioning of air flows.

D. Record pressure drop readings across all major system components and significant drops within duct systems.

E. Adjust air systems with doors leading outside closed. Balance individual rooms simulating occupied conditions. (Windows and doors closed, etc.)

F. Log air flows for occupied and unoccupied conditions.

G. Make flow and pressure measurements at each terminal device, and each supply, return, or exhaust diffuser. Adjust each air outlet unit within plus or minus 10 percent of design requirements, but total air for each system shall be not less than shown. Adjust grilles and diffusers to minimize drafts in all areas. Maintain the building pressure relationships between different zones.

H. Adjust outside air and return air quantities for all systems to within plus or minus 10 percent. Total supply air quantity for any system shall be not less than shown.

I. Adjust exhaust systems to CFM requirements.

J. Test function of automatic dampers and operation of air terminal units. Check all controls for proper operation.

END OF SECTION

The EE Group, Inc.
1521 Rainbow Drive
Gadsden, Alabama 35901

Phone: 256-413-7717

Project: **City of Gadsden, Alabama**
Sports and Recreation Facility
Phase 2

Electrical Engineer: The EE Group, Inc.

EE Group, Inc. Project Number: 4576-20-PHASE 2

END OF TABLE OF CONTENTS

SECTION 26 01 01
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

A. The following codes and standards are referenced in this document.

1. NFPA 70, National Electrical Code, 2017
2. ASHRAE 90.1, Energy Standard for Buildings, 2013
3. Americans with Disabilities Act Accessibility Guidelines (ADAAG) 2010

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Arrange with Alabama Power Company for providing such electrical services as shown on drawings or herein specified. Coordinate all requirements for the electrical services shown on the plans with the utility engineering and construction supervisors prior to bidding and/or roughing.

B. All Aid to Construction Charges will by Alabama Power Company for the required electrical services will be paid directly by the owner (NOT IN CONTRACT).

C. Remove or relocate all electrical services located on or crossing through the Project property, either above or below grade, which would obstruct the construction of the Project or conflict in any manner with the completed Project or any Code pertaining thereto.

D. Furnish and install new underground electrical service entrances as shown on the plans. .

E. Provide and install new sports lighting poles, fixtures and controls as shown on the plans.

F. Furnish and install complete temporary electrical light and power system during construction period. The required temporary lighting required during finish work shall be sufficient so as to facilitate other trades (finishes). Coordinate lighting requirements where interior finishes are being applied with the general contractor and/or painting subcontractor.

G. Furnish and install complete electrical light and power systems.

H. Connect all meters, panelboards, dry type transformers, contactors, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.

I. Furnish and install complete system of outlet boxes, blank faceplates, conduit raceways and terminal cabinets for IT and security systems system.

J. Connect all electrical equipment noted in this Section or noted on Drawings, whether furnished by Electrical Contractor or by others.

K. The electrical contractor shall review all sections of the contract documents (Plans and Specifications) and shall endeavor to determine all equipment requiring electrical power whether shown on the electrical plans or not. Notify the Electrical Engineer in writing prior to the bid with any discrepancies with mechanical and/or plumbing plans. Include in bid price all required materials and labor required for a full functioning system/building.

L. Connect all mechanical and plumbing equipment as required to provide a full functioning system as specified by the Mechanical Engineer. Verify locations for all dampers, and other loads with the mechanical and plumbing plans prior to bidding.

M. Furnish and install all disconnect switches.

N. Furnish and install Auxiliary Systems as shown on the Drawings and as required.

O. Procure and pay for permits and certificates as required by local and state ordinances and Fire Underwriters Certificate of Inspection.

P. Submit to Architect, a certificate of Final Inspection from local inspection department.

Q. Work noted “NIC” (Not in Contract) shall be excluded from the work to be done by this trade, as follows:

1. A complete System of Control Wiring for the Mechanical System (unless specifically shown on Drawings).

2. Motors in place by others, connection for correct rotation by this trade.

1.3 DRAWINGS AND SPECIFICATIONS

A. Electrical work is shown on drawings inclusive. Follow any supplementary drawings as though listed above.

B. Drawings and Specifications are complementary. Work called for by one is binding as if called for by both.

C. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices and routing of conduits to a reasonable extent, without extra cost to Owner.

D. Refer conflicts between drawings and specifications describing electrical work and work under other Sections to Architect for remedial action.

E. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.

F. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which should have been foreseen had examination been made, will not be recognized.

1.4 PROJECT COORDINATION MEETINGS

A. Promptly after award of the Contract, and prior to commencing any project related activities. The Successful Electrical Contractor shall contact the Electrical Engineer to schedule an acceptable date and time for the initial project coordination meeting. This meeting will be held at the Electrical Engineer’s office at the scheduled time to discuss any/all issues related to the electrical aspects of the Project. The Contractor, as well as the contractor’s job foreman for the project is required to attend this meeting. The contractor shall furnish a complete set of Plans and Specifications at this meeting.

1.5 EXISTING CONDITIONS

A. The Contractor shall visit the site and determine all conditions which affect this Contract. Contractor shall include in bid price cost of relocating any electrical or auxiliary lines and/or equipment as required whether shown or not. Failure to do so will in no way relieve Contractor of his/her responsibility under this contract.

1.6 TEMPORARY SYSTEMS

A. The Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing electrical power and lighting to the new building during construction. All temporary wiring shall be made in a safe and approved manner.

B. It shall be the responsibility of the electrical contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary systems requirements.

1.7 CONTRACTOR QUALIFICATIONS

A. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.

B. If the electrical contractor's office is located more than 75 miles from job site, he shall submit for approval the name of the service company within a 20 mile radius of the job site, who will be responsible through him for service required during the warranty period.

C. All electrical contractors whose submitting bids for this project shall be licensed as an electrical sub-contractor in accordance with the State of Alabama Licensing Board for General Contractors.

D. The Electrical Contractor shall be properly licensed (before the bid date) to bid and perform the project. This includes being a properly licensed general Contractor in the State of Alabama, such as having a State of Alabama General contractors License with the Major Classifications "Building Construction" (BC) and "Municipal & Utility" (MU), or a General Contractors License in "Specialty Construction" – Electrical (E), as applicable

E. **The Electrical Contractor shall use State of Alabama licensed masters and journeymen electricians as job superintendents. The Electrical Contractors superintendent (Journeyman or Master Electrician) shall be on site when electrical work is being performed. The Electrical Contractor shall have on Journeyman or Master Electrical on site for every eight (8) apprentices**.

F. The Electrical Contractor shall possess and provide proof of insurance with coverage and limits meeting or exceeding those prescribed under the laws of the State of Alabama for Liability and Workers' Compensation.

G. The Electrical Contractor and his/her sub-contractors shall have been in business (under the same name and principal control) for TEN (10) years prior to date of opening bids and shall have past experience in the types of work involved in this project, and be regularly engaged in all the applicable types of work. Documentation shall be provided on past projects with references and contact information for at least three projects or similar type, size and scope.

H. The Electrical Contractor shall provide documentation to prove that they are a "Drug Free" Workplace, (E.G. Drug Policy, past year's drug test reports, etc.).

1.8 INSURANCE

A. This contractor shall carry Workmen's Compensation Insurance, Public Liability Insurance and shall save Owner free from all damage from suits arising out of the performance of this Contract.

1.9 QUALITY ASSURANCE

A. All work shall be in accordance with the NFPA 70 National Electrical Code NEC 2002 and the rules and regulations of the local bodies having jurisdiction.

B. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.

C. Work under this Section shall be first class with emphasis on neatness and workmanship.

D. Install work using competent mechanics under supervision of foreman, all duly certified by local authorities. Installation subject to Architect's constant observation, final approval, and acceptance. Architect may reject unsuitable work.

E. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Section is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.

F. In event that project is occupied or systems placed in operation in several phases at Owner's request, guarantee will begin on date each system or item of equipment is accepted by the Owner.

G. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.10 ON-SITE OBSERVATIONS AND DEMONSTRATION OF FUNCTIONALITY

A. Contractor shall notify Engineer at least three (3) days prior to covering any underground feeders, pouring slab, installing ceiling systems in order to allow time for on-site observations.

B. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.

C. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner or as called for in other sections of this specification. Contractor shall notify Engineer and Architect two (2) weeks prior to demonstration of systems where manufacturer assistance is required.

D. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.

1.11 PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION

A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect sign, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.

B. Protect items of equipment from stain, corrosion, scratches and any other damage or dirt, whether in storage at job site or installed. No damaged or dirty equipment, lenses or reflectors will be accepted.

1.12 CLEARANCE WITH UTILITIES

A. Before submitting a proposal, check with all authorities or utilities concerned as to points of connection with power and telephone lines, installation of transformers, location of service cut-in and metering, requirements as to any additional service equipment, and other details of the installation. If their requirements are at variance with these specifications or drawings and involve extra expense, these requirements shall be included in bid and the contract price shall include all costs necessary to meet those requirements without extra cost to the Owner after a contract is entered into.

1.13 CHANGES ORDERS AND ADDITONAL WORK

A. No change shall be made from the work as called for by these specifications and drawings except on written order of the Architect. Deviations from drawings and specifications shall be made in submittal form and shall include all information for approval including drawings where

required. No change for extra work will be allowed unless such extra work has been duly authorized by a written order of the Architect stating the change to be made.

1.14 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate connecting electrical service to components furnished under other Sections.

F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

H. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

1.15 AS-BUILT DRAWINGS

A. Contractor to provide to owner at project completion the following:

1. Two (2) compact disc/DVD volumes with color pdf files showing any/all deviations to the contract documents.

2. One each set of electrical plans on reproducible media indicating any/all deviations to contract documents.

3. Two each sets of electrical plans (blue prints) indicating any/all deviations to contract documents.

4. There will be a $100 service charge for electronic drawings. Submit your request in writing and include a check payable to Jack R. Morgan Engineering, Inc.

1.16 COORDINATION WITH OTHER TRADES

A. Review all specification sections and drawings including HVAC, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.

B. Contractor to coordinate all aspects of mechanical equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved submittals prior to roughing. Coordinate exact connection locations with the mechanical contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.

C. Contractor to coordinate all aspects of plumbing equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved equipment submittals prior to roughing. Coordinate exact

connection locations with plumbing contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.

PART 2 - ELECTRICAL PRODUCT REQUIREMENTS

2.1 SUBMITTALS AND MATERIALS DATA

A. For this project - all submittals under this division shall be provided in searchable PDF file format. All warranty materials and O&M manuals shall be provided in searchable PDF file format.

B. The approval of shop drawing shall not be interpreted as a complete check by the Engineer, but will indicate only that the general specifications for the equipment to be provided is satisfactory. Approval of such drawings does not relieve the contractor of responsibility of coordination of components, auxiliary equipment, accessories or special conditions required for satisfactory operation of the completed system.

C. All shop drawings for a specific item shall be made in one submittal. No submittals will be checked until all required submittals are received by the Engineer. All submittals must be approved prior to commencing any work on this project.

D. The electrical contractor shall check all suppliers' submittals regarding measurements, capacity, performance and details to satisfy him/herself that they conform to the intent of the contract drawings and specifications. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by him. Drawings submitted without this stamp of approval will not be considered and will be returned for contractor approval and stamp. A minimum of ten (10) working days shall be allowed for checking for submittals.

E. Any materials and equipment listed which are not in accordance with specification requirements may be rejected.

F. All submittals shall clearly identify the item submitted. Standard catalog sheets shall be marked, in ink, so as to identify which item is to be considered. All drawings submitted must be by factory as field drawings will not be accepted.

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. Encore Wire Corporation.
3. General Cable Technologies Corporation.
4. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, and Type SO.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. Ideal Industries, Inc.
4. O-Z/Gedney; a brand of the EGS Electrical Group.
5. 3M; Electrical Markets Division.
6. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper - Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

H. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems"

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.

2. Results that comply with requirements.

3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.
6. Grounding equipment enclosures.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with NFPA 70, Section 250 (National Electrical Code) for grounding and bonding.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch diameter by 10 feet in length.

B. Chemical-Enhanced Grounding Electrodes (where required to achieve specified grounding system resistance values): Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical and telephone/IT equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.4 LABELING

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells , and at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or panels serving Electronic Equipment: 3 ohm(s).

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

2. Nonmetallic slotted support systems.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70, 2002.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.; a division of Cooper Industries.

c. ERICO International Corporation.

d. GS Metals Corp.

e. Thomas & Betts Corporation.

f. Unistrut; Tyco International, Ltd.

g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.

2) Empire Tool and Manufacturing Co., Inc.

3) Hilti Inc.

4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements specified elsewhere "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified elsewhere.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements specified elsewhere in these specifications for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Non-metal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Non-metal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Hand holes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For all products specified in this section.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways and/or nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches long.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.

7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel.
   b. Type: Setscrew or compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.

10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. RTRC: Comply with UL 1684A and NEMA TC 14.

F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

H. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Composite Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Hubbell - Quazite
    b. Carson Industries LLC.
    c. CDR Systems Corporation; Hubbell Power Systems.
    d. Oldcastle Precast, Inc.; Christy Concrete Products.
    e. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers as called for on plans.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. CDR Systems Corporation; Hubbell Power Systems.
    d. NewBasis.
    e. Nordic Fiberglass, Inc.
    f. Oldcastle Precast, Inc.; Christy Concrete Products.
    g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Green.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

2.5 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Hand hole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC IMC.
2. Concealed Conduit, Aboveground: GRC IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC (as shown on the Plans), direct buried or concrete encased as shown on the Plans.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

5. Change from RNC, Type EPC-40-PVC, to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 02300 "Earthwork" for pipe less than 6 inches in nominal diameter.

2. Install backfill as specified in Section 02300 "Earthwork."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 02300 "Earthwork."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.

b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Nameplate color and information required on nameplate as shown on the Plans.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.

2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Phase A Neutral: White, Black stripe.

5) Phase B Neutral: White, Red stripe.

6) Phase C Neutral: White, Blue stripe.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Phase A Neutral: White/Gray, Brown stripe.

5) Phase B Neutral: White, Gray, Orange stripe.

6) Phase C Neutral: White/Gray, Yellow stripe.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

E. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.

b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control

panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
    a. Indoor Equipment (in equipment rooms): Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
    b. Indoor Equipment (in finished spaces): Engraved, laminated acrylic or melamine label, secured to inside of door. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
    c. Outdoor Equipment: Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage
    d. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    e. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
2. Equipment to Be Labeled:
    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    e. Enclosed switches and circuit breakers.
    f. Enclosed controllers.
    g. Push-button stations.
    h. Contactors.
    i. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

2.2 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Sensor Switch, Inc.
4. Lutron

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:
    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Sensor Switch, Inc.
4. Lutron

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Electrical Identification."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

2. For daylighting controls, adjust set points and dead-band controls to suit Owner's operations.

END OF SECTION

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Products.
2. General Electric Company.
3. Siemens Energy & Automation, Inc.
4. Sola/Hevi-Duty.
5. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Aluminum.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20 and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Consistent with the environment in which the transformer is installed.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

E. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.

F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 80 deg C rise above 40 deg C ambient temperature. Square D Type EE, Watchdog or approved equal.

I. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

J. Wall Brackets: Manufacturer's standard brackets.

K. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution and buck-boost transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 16075 "Electrical Identification."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 26 05 26 "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as required by the manufacturer and/or the project structural engineer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS

A. Ground equipment according to Section 26 05 26 "Grounding and Bonding."

B. Connect wiring according to Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Remove and replace units that do not pass tests or inspections and retest as specified above.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and over-current protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.
7. Include time-current coordination curves for each type and rating of over-current protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01782 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting over-current protective devices.

2. Time-current curves, including selectable ranges for each type of over-current protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

2. Circuit Breakers as called for in the panel schedule.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Dimensions: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

b. Altitude: Not exceeding 2000 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.

2. Altitude not exceeding 6600 feet.

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and/or surface-mounted cabinets as shown on the plans.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250, Type 3R.

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

3. Finishes:

a. Panels and Trim: Steel, factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

b. Back Boxes: Galvanized steel.

4. Directory Card: Inside panelboard door, mounted in primed and painted metal frame with transparent protective cover.

B. Incoming Mains Location: As required – coordinate prior to providing panelboard approval submittals.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric.

B. Note that equipment dimensions shown on the plans are the maximum acceptable dimensions allowable for this project.

C. Panelboards: NEMA PB 1, power and feeder distribution type.

D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with steel tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    h. Multi-pole units enclosed in a single housing or factory assembled to operate as a single unit.
    i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in the position indicated on the plans.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.

B. Mount such that the top-most switch or circuit breaker (in the panel) is not higher than 79 inches above finished floor or grade. Align adjacent panels for a neat appearance.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Tamper-resistant receptacles.
3. Weather-resistant receptacles.
4. Snap switches and wall-box dimmers.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.
7. Pendant cord-connector devices.
8. Cord and plug sets.
9. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; 5351 (single), CR5362 (duplex).
   b. Hubbell; HBL5351 (single), HBL5352 (duplex).
   c. Leviton; 5891 (single), 5352 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; TR8300.
   b. Hubbell; HBL8300SGA.
   c. Leviton; 8300-SGG.
   d. Pass & Seymour; TR63H.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.

2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, weather-resistant type 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; VGF20.

b. Hubbell; GFR5352L.

c. Pass & Seymour; 2095.

d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, weather-resistant, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; GFTR20.

b. Pass & Seymour; 2095TR.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Single Pole:
1) Cooper; AH1221.
2) Hubbell; HBL1221.
3) Leviton; 1221-2.
4) Pass & Seymour; CSB20AC1.
5)

b. Two Pole:
1) Cooper; AH1222.
2) Hubbell; HBL1222.
3) Leviton; 1222-2.
4) Pass & Seymour; CSB20AC2.

c. Three Way:
1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2.
4) Pass & Seymour; CSB20AC3.

d. Four Way:
1) Cooper; AH1224.
2) Hubbell; HBL1224.
3) Leviton; 1224-2.
4) Pass & Seymour; CSB20AC4.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Unbreakable nylon, color by architect with matching screws.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
2. Using the test plug, verify that the device and its outlet box are securely mounted.

3. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified elsewhere in these specifications "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Dimensions: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Provide mounting structure for safety switches independent of the equipment and install flexible connection from switch to equipment as required.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 " Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 43 13
SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.3 CODES AND STANDARDS

A. ANSI/IEEE Std C62.41.1ª-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits

B. ANSI/IEEE Std C62.41.2ª-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

C. ANSI/IEEE Std C62.45ª -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

D. ANSI C8 4.1, American National Standard for Electric Power Systems and Equipment Voltage Ratings (60 Hertz)

E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1

F. National Fire Protection Association (NFPA) 70 (N.E.C.) - Article 285

1.4 DEFINITIONS

A. I nominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.5 QUALITY ASSURANCE

A. All Surge Protective Devices (SPDs) shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories

established in C62.41 (1991). Manufactured in accordance with UL 1449Ó is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

B. Pre-Approval submittals for products by manufacturers not listed above must be submitted not less than ten (10) business days prior to bid date to allow ample engineering time for review of submitted products. Products not submitted within this timeframe will not be reviewed.

C. Submit proper documentation showing detailed (line-by-line) compliance with this specification. Prior approvals not received by the deadline date defined above will not be considered.

D. Along with the line-by-line comparison from manufacturers not listed herein, pre-approval surge suppression submittals shall include all of the items listed in Section V, below.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

3. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.

4. Dimensioned drawing of each suppressor type indicating mounting arrangement.

5. Manufacturers ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).

6. Manufacturers UL 1283 listing classification page and listing number(s).

7. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270 degree electrical phase angles).

8. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).

9. Certificate of declaration that product is CE low voltage directive compliant

10. Statement of manufacturer's warranty duration and replacement policy.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.9 WARRANTY

A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of substantial completion.

B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.

C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Surge Suppression Incorporated (Advantage Series)
2. Emerson (560 and 570 series)
3. Current Technology. (SL3-150 Series)

B. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.

C. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.

D. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters), in combination with or for the protection of the suppression elements are expressly prohibited and will be rejected.

E. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein.

2.2 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. The Surge Protective Devices (SPD’s) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

E. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)

F. SPD's shall be Type 2 SPD's, Type 4 SPD's are not permitted.

G. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

H. The SPD shall be self-restoring and fully automatic.

I. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.

J. Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request.

K. The SPD shall have a Nominal Discharge Current (In) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.)

L. Fusing:

1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.

2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated "silver-fuse-wire" (or other).

3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected.

4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

M. MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

N. Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar" short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

O. Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6 dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G).

When a mode of protection is specified, the protective mode must be specifically included. Thus, Line-to-Neutral-to-Line is not acceptable where Line-to-Line is specified.

P. Sinewave Tracking Capability: Power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Sinewave Tracking circuitry. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking! To demonstrate the sinewave tracking capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming sinewave tracking capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A1 (2kV, 67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity, on a 120/208Vrms, 3 phase Wye device, on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The “let-through voltage” derived from each of these tests shall have a maximum amplitude of less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient. Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section VIII below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A1.

Q. Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.

R. Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking “Listed to UL 1449”, shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.

S. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with “load carrying” components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

T. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.

U. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

V. Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

2.3 PERFORMANCE REQUIREMENTS

A. SPDs shall meet the following performance requirements:

1. Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the section below.

2. Building Distribution Panels (Category B): The SPD shall provide a minimum protection of 180 kA per phase and be capable of meeting the Category B3-High Let-Through Voltage criteria as shown in the section below.

3. Branch Panels/Panelboards (Non-Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.

4. Branch Panels/Panelboards (Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase, be of sinewave tracking design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the section below.

2.4 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

A. The SPD shall meet the Let-Through Voltage requirements shown below for voltage and locations specified. All voltages shall be peak (+or -10%) Positive Polarity, Time base = 10uS, Sampling Rate = 500ms/s to ensure maximum transient capture. These settings assure Let-through Voltage test results are accurate. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (un-powered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

1. Service Entrance Panels - ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree phase angle shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

   a. Line to Neutral: 1075 V for 208Y/120 V and 1340V for 480Y/277 V

   b. Line to Line: 1990 V for 480Y/277 V and 1390 V for 208Y/120 V.

   c. Line to Ground: 1310 V for 480Y/277 V and 1060 V for 208Y/120 V.

   d. Neutral to Ground: 1730 V for 480Y/277 V and 1450 V for 208Y/120 V.

2. Distribution and Branch Panels (non-electronics) - ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

   a. Line to Neutral: 520 V for 480Y/277 V and 395 V for 208Y/120 V.

   b. Line to Line: 790 V for 480Y/277 V and 570 V for 208Y/120 V.

   c. Line to Ground: 500 V for 480Y/277 V and 375 V for 208Y/120 V.

   d. Neutral to Ground: 1010 V for 480Y/277 V and 590 V for 208Y/120 V.

3. Branch Panels Feeding Electronic Equipment - ANSI/IEEE Cat. A Ring Wave Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 67 amps, 100kHz ring wave) at the 270 degree phase angle, shall be less than; (values are total let-through

voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):

a. Line to Neutral: 67 V for 480Y/277 V and 30 V for 208Y/120 V.

b. Line to Line: 65 V for 480Y/277 V and 60 V for 208Y/120 V.

c. Line to Ground: 85 V for 480Y/277 V and 50 V for 208Y/120 V.

d. Neutral to Ground: 65 V for 480Y/277 V and 50 V for 208Y/120 V.

2.5 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

A. Voltage Protection Rating (VPR) is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

1. Single Phase Units (120/240 Volt)

a. Line to Neutral: 600 V .

b. Line to Ground: 600 V.

c. Neutral to Ground: 700 V.

d. Line to Line: 1000 V.

2. Three Phase Units (120/208 Volt)

a. Line to Neutral: 600 V .

b. Line to Ground: 600 V.

c. Neutral to Ground: 700 V.

d. Line to Line: 1000 V.

2.6 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R or Type 4X.

2.7 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest

leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."

2. Controls: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."

F. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

G. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.

H. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

I. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer’s installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12” of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer’s recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.

J. If any lead lengths exceed 18”, the Contractor responsible for installation must contact the specifying electrical engineer and the surge suppression manufacturer or distributor (888-212-2728) for installation assistance.

K. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

L. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.

M. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.

N. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer’s recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by

the Contractor. Provide written documentation of this inspection as part of the closeout documentation

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Section 26 27 26 - "Wiring Devices"
2. Section 26 09 23 - "Lighting Control Devices"

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests IES LM-79 and IES LM-80.

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

E. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.

2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. On-site coordination meetings: Provide three on-site coordination meetings between contractor and authorized lighting manufacturer's representative to review the following:

1. Pre-construction meeting, prior to rough in stage to review control wiring diagrams, control component placement, occupancy sensor location/placement, wiring types and interconnections, locations of racks/panels, and general overview of control system.

2. Mock up review, after completion of mock-up areas to review operation of each area type for correct operation. At this meeting, the general settings, adjustments, and programming shall be documented and implemented.

3. Final operational test shall take place at substantial completion to verify proper operation of entire building and site lighting control systems. Final settings and programming adjustments shall be made to the satisfaction of the engineer and architect and fully documented for future reference by the owner as required, and included/provided in the final closeout documentation.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings or approved equal by Lithonia Lighting or Philips Lighting.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED fixtures: Comply with UL 1598. L80 Performance for 50,000 hours. Color temperature consistency shall be indistinguishable and the color shift over a five year period shall be less than 0.007 on the CIE 1976 (u',v') diagram, or a 7-step MacAdam ellipse.

C. Sheet Metal Components:

1. Formed from 22 gauge steel unless otherwise indicated.

2. Form and support to prevent warping and sagging.

3. Free of burrs and sharp corners and edges.

4. Cleaned and powder-coated after fabrication

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Doors, Frames, and Other Internal Access:

1. Spring loaded cam type latches.

2. Gasketed lens frame – fixture to be free of light leakage under operating conditions.

3. Designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

F. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: 0.125 inch MINIMUM unless otherwise indicated.

b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

2.3 LED DRIVERS

A. LED drivers shall be fully accessible from below ceiling.

B. Ambient temperature ratings shall be -40 deg F minimum, 130 deg F maximum

C. Power factor: 0.94 or higher

D. Total Harmonic distortion: <20%

E. Minimum warranty on drivers 5 years

F. NRTL certified (UL/CSA/FM)

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.

b. Charger: Fully automatic, solid-state type with sealed transfer relay.

c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports:

1. Install ceiling support system wires, independent of the ceiling suspension devices and grid, to all four (4) corners of each fixture.

2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Connect wiring according to Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

END OF SECTION

SECTION 26 56 19
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. LED Arrays, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-80.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Drivers: Two (2) of each type and rating installed.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: Two (2) of each type installed.
3. Diffusers and Lenses: One for every 100of each type installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures, including luminaire support components.
    b. Faulty operation of luminaires and accessories.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. L70 lamp life of 50,000 hours.

F. Lamps dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

H. Nominal Operating Voltage: 277 V ac.

I. In-line Fusing: Separate in-line fuse for each luminaire.

J. Source Limitations: Obtain luminaires from single source from a single manufacturer.

K. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

    a. Color: Dark bronze.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected from manufacturer's standard catalog of colors.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and canopy ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

I. Coordinate layout and installation of luminaires with other construction.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION

SECTION 26 57 00
CONCRETE SPORTS LIGHTING POLES

PART 1 - GENERAL

1.1 SCOPE

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the performance and design standards for GADSEN CITY SPORTS COMPLEX soccer fields using an LED lighting source. The contractor shall supply lighting equipment to meet or exceed the standards set forth by the criteria set forth in these specifications.

1.2 LIGHTING PERFORMANCE

A. Performance Requirements: Playing surfaces shall be lit to an average light level and uniformity as specified on the drawings. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.

1.3 WARRANTY

A. New fixtures on new poles: 25-Year Warranty: Each manufacturer will supply their own specific written warranty covering lamp replacements, parts, labor and performance as specified above for 25 years. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1.4 DELIVERY TIMING

A. Equipment On-Site: The equipment must be on-site 4-6 weeks from receipt of approved submittals and receipt of complete order information

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Acceptable sports lighting manufacturers for this project:
1. ~~Musco Lighting~~

B. Substitutions
1. ~~Any proposed substitution must be submitted a minimum of 10 days prior to the bid. Any proposed substitution must be fully demonstrated to the owner prior to the bid and must FULLY integrate with, match aesthetically and match functionally the existing Musco components at the same level as the specified system. Any system or component that has not been demonstrated to the full satisfaction of the owner or has not been deemed acceptable by the owner prior to the bid will not be accepted. The Owner and engineer reserve the right to reject and deny any substitution that it may, in its sole discretion, deem unequal, and the findings in this regard shall be accepted by the bidder as final and binding~~

2.2 LIGHTING SYSTEM CONSTRUCTION

A. System Description: Lighting system shall consist of the following:

1. ~~Galvanized steel poles~~ and crossarm assembly
2. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied.
3. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.
4. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10’ above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
6. Controls Cabinet to provide on-off control of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.

B. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.

C. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated for protection against corrosion and stress corrosion cracking. All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.

D. Lightning Protection: All structures shall be equipped with lightning protection meeting NFPA 780 standards. Contractor shall supply and install a ground rod of not less than 5/8” in diameter and 8’ in length, with a minimum of 10’ embedment. Ground rod should be connected to the structure by a copper main down conductor with a minimum size of #2 for poles with less than 75’ mounting height and 2/0 for poles with more than 75’ mounting height.

E. Safety: All system components shall be UL Listed for the appropriate application.

F. Electric Power Requirements for the Sports Lighting Equipment:

1. Electric power: 480 Volt, 3 Phase
2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

2.3 STRUCTURAL PARAMETERS

A. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the 2009 edition of the IBC Building Code, wind speed of 90mph, exposure category C and an importance factor of 1.0. Luminaire, visor, and crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment.

B. Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO 2001 (LTS-4) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

C. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report. If a geotechnical report is not provided by the owner, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2001 IBC, Table 1804.2-I-A.

It shall be the contractor's responsibility to notify the owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the owner's approval / payment for additional costs associated with:

a) Providing engineered foundation embedment design by a registered engineer in the State of Alabama.
b) Additional materials required to achieve alternate foundation.
c) Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

A. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

B. Owner shall provide core type soil borings at locations to be specified by the electrical & geotechnical engineers to determine prevailing soil conditions. Soil boring reports and soil pressure calculations shall be performed by a professional engineer and shall be provided to the contractor by the owner.

C. Contractor shall have a registered structural engineer review the soil boring reports, and soil pressure calculations and make final recommendations regarding the required pole base, pole embedment depths, backfill type and any special considerations for the required pole foundations. All engineering consulting costs shall be included in contractor's bid price. Contractor to provide contact information for structural engineer for above scope of work in bid form. Contractor to provide unit prices (per linear foot) for additional pole excavations in normal soil and rock for use by the project engineer in change order processing.

D. For bidding required pole embedment depths are assumed 12 ft. or to weathered rock. Actual pole embedment depths will be determined by the structural engineer and the geotechnical engineer. Should deeper pole embedment depths be required, unit pricing (as noted above) will be applied.

E. Contractor is responsible for sleeves or other means to keep soils out of the pole drillings/excavations.

F. <u>All pole excavations are unclassified. Remove all spoils as required, dress/repair grade to match existing</u>.

2.4 MATERIALS

A. <u>Concrete</u> – The concrete mix shall achieve a minimum 28-day centrifugally compacted compressive strength of 10,000 psi, corresponding to statically cast compressive cylinder strength of 8500 psi. Cement shall conform with ASTH-C150. Maximum size aggregate shall be ¾ inch. Water reducers, retarders or, accelerating admixtures shall conform to ASTM-C494. Water shall be free from foreign materials in amounts harmful to concrete and embedded steel.

2.5 FABRICATION

A. Poles shall be constructed so that wiring and grounding facilities are concealed within the pole.

2.6 ELECTRICAL COMPONENTS

A. Crossarms
   1. Shall provide the number of mounting positions/ connections as required for the number of fixtures indicated on drawings.

2.7 POLE ACCESSORIES

A. Provide a continuous solid copper ground wire in the pole. The ground wire shall terminate in a copper coupling at the top of the platform/crossarm level and approximately 12” below grade. The copper coupling provides ½” x 24” lighting rod attached to the pole at the top. Provide for attaching and wiring any disconnect switches or other electrical components.

B. Provide and install fixture mounting crossarms as shown on the plans or required to support specified fixtures.

C. All components are to be U.L. listed for the intended purpose.

D. Provide complete detailed shop drawings from the manufacturer to the engineer for review. These shop drawings shall show in detail all construction components of crossarms, wiring, and mounting assemblies to pole and for lighting fixtures. They shall also show the crossarms as mounted to the poles.

E. The Electrical Contractor shall be responsible for all field assembly and installation per the manufacturer's recommendations and/or requirements.

PART 3 - EXECUTION

3.1 HANDLING & ERECTION

A. Transportation, site handling and erection shall be performed by qualified personnel with acceptable equipment and methods.

B. Poles shall be lifted and supported during the manufacturing, stock piling, transporting and erection operations only at the lifting or support points, or both, as shown on the shop or erection drawings.

C. Erection drawings shall be provided which identify the structure number, structure length, shipping weight, center of gravity and lifting points. Each pole shall be clearly marked with the corresponding information.

D. Prior to unloading pole, shop drawings shall be reviewed to identify proper pick-up points for unloading, storage and erection procedures.

3.2 MISCELLANEOUS

A. Poles bases are designed to be directly embedded in the soil, and backfilled with a compacted sand, gravel, concrete or other suitable material.

B. For bidding and estimating purposes, an embedment depth of 10% of the overall pole length plus an additional five feet may be used.

C. Prior to unloading pole, shop drawings shall be reviewed to identify proper pick-up points for unloading, storage and erection procedures.

D. Store poles on the job site as directed by the manufacturer.

E. Perform soils analysis as necessary to determine suitable pole embedment depths.

3.3 HAZARD MITIGATION

A. All necessary precautions as required by national and local safety codes for handling and erection utility poles shall be exercised. Proper clearance from high voltage circuits must be maintained at all times. POLES ARE CONSIDERED TO BE CONDUCTOR OF ELECTRICITY.

END OF SECTION

LEGEND

TP-1 BORING LOCATION

NOTE:
TEST PIT LOCATIONS SHOWN ARE APPROXIMATE.

TP-14
TP-15
FIELD 3
TP-12
TP-2
TP-11
TP-13
TP-10
FIELD 2
TP-3
TP-8
FIELD 4
TP-9
TP-1
TP-4
TP-7
TP-5
TP-6
FIELD 1

40 0 40
SCALE IN FEET

CDG
Engineering Environmental Answers
GADSDEN, AL
HOOVER, AL
HUNTSVILLE, AL
ANDALUSIA, AL
AUBURN, AL
DOTHAN, AL

224 BROAD ST. SUITE 201
GADSDEN, AL 35901

P.O. BOX 2079 (35950)
PH: (256) 543-9431

TEST PIT LOCATION MAP

GADSDEN SPORTS PARK - PHASE II
CITY OF GADSDEN
ETOWAH COUNTY, ALABAMA

SCALE: AS SHOWN
DATE: OCTOBER 2021
REVISED

PROJECT NO: R628120055

SHEET NO. 1 of 1

Test Pit TP-1

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 4" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Stiff, tan, sandy CLAY									
1											3.0	
2												
3												
4			...reddish tan								3.0	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-2

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 12" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Medium, gray, clayey SILT									
1			Stiff, tan, sandy CLAY									
2											2.75	
3												
4			...reddish tan								3.0	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-3

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
No topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Red, silty SAND (Fill)									
1			Soft to medium, gray, sandy SILT									
2												
3			Stiff, reddish tan, sandy CLAY								3.5	
4												
5			(Terrace Deposits)								3.5	
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-4

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 2" of topsoil or 1" of asphalt with crusher run present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Stiff, red, sandy CLAY									
			(Fill)								2.5	
1			Medium to stiff, brown, sandy SILT									
2			Stiff, reddish tan, sandy CLAY									
3											3.0	
4												
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-5

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
No topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Medium dense, red, silty SAND (Fill)									
3			Medium, gray, sandy SILT									
5			Stiff, reddish tan, sandy CLAY (Terrace Deposits)								2.0	
6.5			Test pit terminated at 6.5 feet.									

Test Pit TP-6

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 3" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Medium dense, orange, clayey SAND (Fill)									
1			Medium to stiff, brown, sandy SILT									
2												
3			Stiff, orange, sandy CLAY (Terrace Deposits)								2.5	
4												
5			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-7

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 3" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Stiff, red, sandy CLAY									
1											2.0	
2			(Fill)									
3			Medium, gray, sandy SILT									
4			Stiff, tan and red, sandy CLAY									
5											2.0	
6			(Terrace Deposits)									
7			Test pit terminated at 6.0 feet.									
8												
9												

Test Pit TP-8

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
No topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Medium dense, red, silty SAND (Fill)									
2			Stiff, tan, sandy CLAY								2.0	
5			Medium, gray, sandy SILT (Terrace Deposits)									
7			Test pit terminated at 7.0 feet.									

Test Pit TP-9

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 3" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Stiff, orange, sandy CLAY								3.0	
2			Medium, gray, sandy SILT (Terrace Deposits)									
5			Test pit terminated at 5.0 feet.									

Test Pit TP-10

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 1" of asphalt and crusher run present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Stiff, red, sandy CLAY (Fill)								1.5	
1			Medium, gray and brown, sandy SILT									
2			Very stiff, tan and red, sandy CLAY								3.5	
3												
4												
5			(Terrace Deposits)									
6			Test pit terminated at 5.5 feet.									
7												
8												
9												

Test Pit TP-11

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
No topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
1			Medium dense, red, silty SAND (Fill)									
2			Medium, gray, sandy SILT									
3			Very stiff, tan and red, sandy CLAY								3.5	
4												
5			(Terrace Deposits)									
6			Test pit terminated at 5.5 feet.									
7												
8												
9												

Test Pit TP-12

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 6" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
0			Very stiff, orange, sandy CLAY									
1											>4.0	
2												
3												
4											>4.0	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-13

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 3" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength
No groundwater encountered at time of excavation.

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
			Stiff, orange, sandy CLAY with chert (Fill)									
1			Very stiff, orange and tan, sandy CLAY									
2											>4.0	
3												
4											3.5	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-14

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 8" of topsoil present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
			Medium, gray, sandy SILT									
1			Stiff to very stiff, orange, sandy CLAY									
2											>4.0	
3												
4											2.5	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

Test Pit TP-15

Project Name: Gadsden Sports Park - Phase II
Project Location: Etowah County, Alabama
CDG Project Number: R628121718
Date Excavated: 10/20/2021 Approx. Ground Elevation: Unknown

Notes:
Approximately 3" of crushed aggregate present at ground surface.
PPqu=Pocket Penetrometer Unconfined Compressive Strength

Depth (ft.)	Elev. (ft.)	Graphic Log	Material Description	Type	Blows/1.75" (CPR)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
			Stiff, red, sandy CLAY (Fill)								2.0	
1			Stiff, tan and orange, sandy CLAY									
2											3.0	
3												
4											3.0	
5			(Terrace Deposits)									
			Test pit terminated at 5.0 feet.									
6												
7												
8												
9												

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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

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

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

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

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

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

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

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

CERTIFICATE HOLDER

CITY-54

City of Gadsden
90 Broad Street
Gadsden, AL 35901

CANCELLATION

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

AUTHORIZED REPRESENTATIVE

ACORD 25 (2016/03)

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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

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

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

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

INSURED
OWNER AND
CONTRACTOR

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

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

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

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

CERTIFICATE HOLDER

CITY-54

City of Gadsden
90 Broad Street
Gadsden, AL 35901

CANCELLATION

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

AUTHORIZED REPRESENTATIVE

ACORD 25 (2016/03)