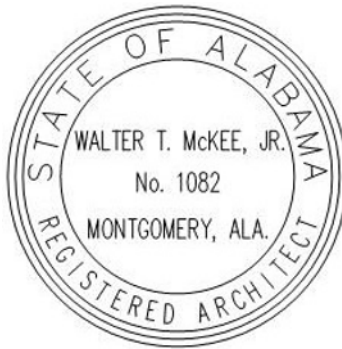


1.

**A New Community Center
at
Knox Street Park
for the
City of Troy
Troy, Alabama**

LATHAN MCKEE PROJECT NO. MKA 24-261



(Recipient) List of Contracts

Grant No. # LR-CE-PF-25-015

Table of Contents

1. Specifications Title Page
2. Advertisement for Bids
3. Information for Bidders
4. Bid Bond Form
5. Bid for Unit Price Contracts
6. Bid for Lump Sum Contracts
7. Certificate from Contractor/Subcontractor Designating Officer or Employee to Supervise Payment of Employees
8. Certification of Bidder Regarding Equal Employment Opportunity
9. Certification of Bidder Regarding Section 3 and Segregated Facilities
10. Contractor Section 3 Plan Format (if bid equals or exceeds \$10,000)
11. Certification by Proposed Subcontractor Regarding Equal Employment Opportunity
12. Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities
13. Contract Form
14. Bonding and Insurance Requirements
15. Payment Bond
16. Performance Bond
17. Notice of Award
18. Notice to Proceed
19. Notice of Start of Construction
20. Notice of Start of Demolition
21. Change Order
22. Final Summary Change Order
23. Certification by Owner
24. Certificate of Owner's Attorney
25. Final Inspection Certification
26. Beason-Hammon/E-Verify Certification
27. General Conditions
28. Supplemental General Conditions
29. As-Built Certification Form

ADVERTISEMENT FOR BIDS

Lathan McKee – Montgomery Office

Project No. 24-261

Grant No. LR-CE-PF-25-015

City of Troy

(Owner)

Separate sealed bids for A New Community Center at Knox Street Park will be received by Shannon Bryan, City Clerk at Troy City Hall, 301 Charles W. Meeks Avenue, Troy, AL 36081, until **2:00 o'clock P.M. on Thursday, November 17, 2026**, and then at said office publicly opened and read aloud.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Form of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following location: Lathan McKee website at www.lathanmckee.com.

Copies may be obtained at the office of Lathan McKee, 3500 Eastern Blvd., Suite 300, Montgomery, AL 36116 upon request. Send request to mckeeplans@gmail.com.

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

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

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

No bidder may withdraw its bid within thirty (90) days after the actual date of the opening thereof.

A Mandatory Pre-bid Meeting will be held on Tuesday, November 3, 2026, at 10:00 AM.

Bidder's attendance is not required but encouraged.

(Date)

3.

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids:

The _____ (herein called the "Owner"), invites bids of the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the office of _____ until _____ o'clock A.M./P.M., EST/CST/DST, _____, 20_____, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to _____ at _____ and designated as bid for _____.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

2. Preparation of Bid: Each bid must be submitted on the prescribed form and accompanied by Certification of Bidder Regarding Equal Employment Opportunity, Form 950.1; and Certification of Bidder Regarding Section 3 and Segregated Facilities. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

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

- a. Must be acceptable to the Owner.
- b. Must submit Form 950.2, Certification by Proposed Subcontractor Regarding Equal Employment Opportunity; and Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities. Approval of the proposed subcontract award cannot be given by the Owner unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

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

4. Telegraphic Modification: Any bidder may modify his/her bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If

written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

5. Method of Bidding: The Owner invites the following bid type(s): [Unit Price / Lump Sum] Contracts
6. Qualifications of Bidder: The Owner may make such investigations as he/she deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.
7. Bid Security: Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the Bid Bond Form attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid, not to exceed \$10,000. Such cash, checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or if no award has been made within 30 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he/she has not been notified of the acceptance of his/her bid.
8. Liquidated Damages for Failure to Enter into Contract: The successful bidder, upon his/her failure or refusal to execute and deliver the contract and bonds required within ten (10) days after he/she has received notice of the acceptance of his/her bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal the security deposited with his/her bid.
9. Time of Completion and Liquidated Damages: Bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" of the Owner and to fully complete the project within _____ consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages the sum of \$_____ for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.
10. Conditions of Work: Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provisions of his/her contract. Insofar as possible, the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.
11. Addenda and Interpretations: No interpretation of the meaning of the plans, specification or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to _____ at _____, and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three (3) days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.
12. Security for Faithful Performance: Simultaneously with his/her delivery of the executed contract, the contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

13. Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
14. Notice of Special Conditions: Attention is particularly called to those parts of the contract documents and specifications which deal with the following:
- a. Inspection and testing of materials.
 - b. Insurance requirements.
 - c. Wage rates.
 - d. Stated allowances.
15. Laws and Regulations: The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.
16. Method of Award – Lowest Qualified Bidder: If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the contract, the contract will be awarded on the base bid only. If such bid exceeds such amount, the Owner may reject all bids or may award the contract on the base bid combined with such deductible alternates applied in numerical order in which they are listed in the Form of Bid, as produces a net amount which is within the available funds.
17. Obligation of Bidder: At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his/her bid.
18. Safety Standards and Accident Prevention: With respect to all work performed under this contract, the contractor shall:
- a. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No. 75, Saturday, April 17, 1971.
 - b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
 - c. Maintain at his/her office or other well-known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.
19. State of Alabama Licensing Requirements: In order for his/her bid to be received and considered, the bidder must comply with the applicable State law regarding contractor licensing requirements. Selected excerpts from the State law are presented below:

34-8-6 Prohibited Acts: Penalties

Any person, firm or corporation not being duly authorized who shall engage in the business of general contracting in this state, except as provided for in this chapter, and any person, firm or corporation presenting

or attempting to file as its own the license certificate of another, or who shall give false or forged evidence of any kind to the board, or to any member thereof, in obtaining a certificate of license, or who falsely shall impersonate another, or who shall use an expired or revoked certificate of license, and any person including an owner, architect or engineer who receives or considers a bid from any one not properly licensed under this chapter, shall be deemed guilty of a misdemeanor and shall for each offense of which he is convicted be punished by a fine of not less than \$500.00 or imprisonment of six months, or both fine and imprisonment, in the discretion of the court.

The submission of the contractor's current license number before considering the bid shall be sufficient evidence to relieve the owner, architect, engineer of awarding authority of any liability under this chapter.

34-8-8 Copy of Chapter to be Included in Plans or Architects and Engineers:

All architects and engineers preparing plans and specifications for work to be contracted in the State of Alabama shall include in their invitations to bidders and their specifications a copy of this chapter or such portions thereof as are deemed necessary to convey to the invited bidder, whether they are a resident or nonresident of this state and whether a license has been issued to him or not, the information that it will be necessary for him to show evidence of license before its bid is considered. (Acts 1935, No. 297, p. 721; Code 1940, T.46 Section 79; Acts 1959, No. 571, p. 1429.)

NAME OF COMPANY: _____

ADDRESS OF COMPANY: _____

COMPANY TELEPHONE NO: _____

COMPANY CONTACT PERSON: _____

CONTRACTOR'S CURRENT LICENSE NO: _____

ISSUING AGENCY: STATE OF _____ EXPIRATION DATE: _____

BID LIMIT: _____ CLASSIFICATION: _____

20. Buy America Preference: The Grantee must comply with the requirements of the Build America, Buy America (BABA) Act, 41 USC 8301 note, and all applicable rules and notices, as may be amended, if applicable to the Grantee's infrastructure project. Pursuant to HUD's Notice, "Public Interest Phased Implementation Waiver for FY 2022 and 2023 of Build America, Buy America Provisions as Applied to Recipients of HUD Federal Financial Assistance" (88 FR 17001), any funds obligated by HUD on or after the applicable listed effective dates, are subject to BABA requirements, unless excepted by a waiver.

BID BOND FORM

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal, and
 _____ as Surety, are hereby held and firmly bound unto
 _____ as owner in the penal sum of _____ for the payment of which, well
 and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors
 and assigns. Signed, this _____ day of _____, 20_____.

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

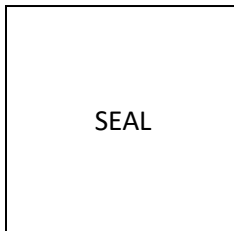
NOW, THEREFORE,

- a. If said Bid shall be rejected, or in the alternate.
- b. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for its faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid.

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

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



_____(L.S.)
 Principal

 Surety

By: _____

5.

BID FOR UNIT PRICE CONTRACTS

Place _____

Date _____

Project No. _____

Proposal of _____ (hereinafter called "Bidder") doing business as [a corporation*],
organized and existing under the laws of the State of _____. To the _____
(hereinafter called "Owner").

Ladies and Gentlemen:

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

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

Bidder hereby agrees to commence work under this contract on or before a date to be specified, written "Notice to Proceed" of the Owner, and to fully complete the project within _____ consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of \$ _____ for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

Bidder acknowledges receipt of the following addendum:

* - Insert corporation, partnership or individual as applicable

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

Item No	Description	Est Qty	Unit Price (Each)	Total
1			Dollars & Cents (\$ _____)	Dollars & Cents (\$ _____)
2			Dollars & Cents (\$ _____)	Dollars & Cents (\$ _____)
3			Dollars & Cents (\$ _____)	Dollars & Cents (\$ _____)
Total of Bid				Dollars & Cents (\$ _____)

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

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

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

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within ten (10) days and deliver a Surety Bond or Bonds as required by Paragraph 29 of the General Conditions. The bid security attached in the sum of _____ (\$ _____) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expenses the Owner caused there.

Respectfully submitted:

By _____
(Signature)

(Title)

(Business Address & Zip Code)

(SEAL – if bid is by
a corporation)

6.

BID FOR LUMP SUM CONTRACTS

Place _____

Date _____

Project No. _____

Proposal of _____ (hereinafter called "Bidder") doing business as [a corporation*],
organized and existing under the laws of the State of _____. To the _____
(hereinafter called "Owner").

Ladies and Gentlemen:

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

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

Bidder hereby agrees to commence work under this contract on or before a date to be specified, written "Notice to Proceed" of the Owner, and to fully complete the project within _____ consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of \$ _____ for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

Bidder acknowledges receipt of the following addendum:

BASE PROPOSAL: Bidder agrees to perform all of the _____ work described in the specifications and shown on the plans for the sum of _____ (\$ _____).

* - Insert corporation, partnership or individual as applicable

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

ALTERNATE PROPOSALS:

Alternate No. 1: _____

Deduct the sum of _____ (\$ _____)

Alternate No. 2: _____

Deduct the sum of _____ (\$ _____)

Alternate No. 3: _____

UNIT PRICES:

For changing quantities of work items from those indicted by the contract drawings upon written instructions from the architect/engineer, the following unit prices shall prevail:

- | | |
|----------|----------|
| 1. _____ | \$ _____ |
| 2. _____ | \$ _____ |
| 3. _____ | \$ _____ |

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for. Changes shall be processed in accordance with paragraph 17(a) of the General Conditions.

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

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within ten (10) days and deliver a Surety Bond or Bonds as required by Paragraph 29 of the General Conditions.

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

Respectfully submitted:

By _____
(Signature)

(Title)

(Business Address & Zip Code)

(SEAL – if bid is by
a corporation)

7.

**CERTIFICATE FROM CONTRACTOR/SUBCONTRACTOR DESIGNATING OFFICER OR EMPLOYEE TO SUPERVISE PAYMENT
OF EMPLOYEES**

Project Name: _____

Date: _____

Location: _____ Project No: _____

(I / We) hereby certify that (I am / we are) (the prime contractor / a subcontractor) for _____

(Specify "General Construction", "Plumbing", "Roofing", etc.)

in connection with construction of the above mentioned CDBG Project, and that (I / we) have appointed

_____, whose signature appears below, to supervise the payment of (my / our)

employees beginning _____, 20_____. That he/she is in a position to have full knowledge of

the facts set forth in the payroll documents and in the Statement of Compliance required by the so-called Kick-Back

Statute which he/she is to execute with (my / our) full authority and approval until such time as (I / we) submit to the

_____ a new certificate appointing some other person for the purposes herein above stated.

(Name of Grantee)

(Signature of Appointee)

(Name of Firm or Corporation)

List with signatures all owners, partners, and/or officers of the Corporation below:

(Signature)

(Title)

(Signature)

(Title)

(Signature)

(Title)

Note: This certificate must be executed by authorized officers of the corporation and/or by members of the partnership, and shall be executed prior to and be submitted with the first payroll. Should the appointee be changed, a new certificate must accompany the first payroll for which the new appointee executes the Statement of Compliance required by the Kick-Back Statute. A new designation is not necessary as long as the person signing the Statement of compliance is an owner, partner or officer of the Corporation whose signature appears above.

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY**INSTRUCTIONS:**

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

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven (7) calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION BY BIDDER:

Name and Address of Bidder (include zip code): _____

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

☐ Yes ☐ No

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

☐ Yes ☐ No

3. Bidder has filed all compliance reports due (Date) _____ under applicable instructions, including Monthly Employment Utilization Report (257).

☐ Yes ☐ No ☐ None Required

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

☐ Yes ☐ No

Name and Title of Signer (please print or type)

Signature

Date

9.

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND SEGREGATED FACILITIES

Name of Prime Contractor

Project Name

Project Number

The undersigned hereby certifies that:

- a. Section 3 provisions are included in the Contract.
- b. A written Section 3 plan was prepared and submitted as part of the bid proceedings (if bid equals or exceeds \$10,000).
- c. No segregated facilities will be maintained.

Name and Title of Signer (please print or type)

Signature

Date

CONTRACTOR SECTION 3 PLAN FORMAT (if bid equals or exceeds \$10,000)

(Name of Contractor) agrees to implement the following specific affirmative action steps directed at increasing the utilization of lower income residents and businesses within the City/County of _____.

- A. To ascertain from the locality's CDBG program official the exact boundaries of the Section 3 covered project area and where advantageous, seek the assistance of local officials in preparing and implementing the affirmative action plan.
- B. To attempt to recruit from within the city/county the necessary number of lower income residents through: Local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within or serving the project area such as Service Employment and Redevelopment (SER), Opportunities Industrialization Center (OIC), Urban League, Concentrated Employment Program, Hometown Plan, or the U.S. Employment Service.
- C. To maintain a list of all lower income residents who have applied either on their own or on referral from any source, and to employ such persons, if otherwise eligible and if a vacancy exists.
- *D. To insert this Section 3 plan in all bid documents, and to require all bidders on subcontracts to submit a Section 3 affirmative action plan including utilization goals and the specific steps planned to accomplish these goals.
- *E. To insure that subcontracts which are typically let on a negotiated rather than a bid basis in areas other than Section 3 covered project areas are also let on a negotiated basis, whenever feasible, when let in a Section 3 covered project area.
- F. To formally contact unions, subcontractors and trade associations to secure their cooperation for this program.
- G. To insure that all appropriate project area business concerns are notified of pending sub-contractual opportunities.
- H. To maintain records, including copies of correspondence, memoranda, etc., which document that all of the above affirmative action steps have been taken.
- I. To appoint or recruit an executive official of the company or agency as Equal Opportunity Officer to coordinate the implementation of this Section 3 plan.
- J. To list on Table A, information related to subcontracts to be awarded.
- K. To list on Table B, all projected workforce needs for all phases of this project by occupation, trade, skill level and number of positions.

As officers and representatives of (Name of Contractor), we the undersigned, have read and fully agree to this Affirmative Action Plan, and become a party to the full implementation of this program.

Signature	Title	Date
Signature	Title	Date

*-Loan, grants, contracts and subsidies for less than \$10,000 will be exempt

CONTRACTOR SECTION 3 PLAN FORMAT (continued)

PROPOSED SUBCONTRACTS BREAKDOWN TABLE A

FOR THE PERIOD COVERING _____, 20____ THROUGH _____, 20____

(Duration of the CDBG-Assisted Project)

Column 1	Column 2	Column 3	Column 4	Column 5
Type of Contract (Business or Profession)	Total Number of Contracts	Estimated Number Total Approximate Dollar Amount	Contracts to Project Area Businesses	Estimated Dollar Amount to Project Area Businesses

* The Project Area is coextensive with the City/County of _____'s boundaries.

Company

Project Name

Project Number

EEO Officer – Signature

Date

CONTRACTOR SECTION 3 PLAN FORMAT (continued)

ESTIMATED PROJECT WORKFORCE BREAKDOWN TABLE B

Column 1	Column 2	Column 3	Column 4	Column 5
Job Category	Total Estimate Position	No. of Positions Currently Occupied by Permanent Employees	No. of Positions Not Currently Occupied	No. of Positions to be Filled with *L.I.P.A.R.
Officers/Supervisors				
Professionals				
Housing Sales/Rental Managements				
Office/Clerical				
Service Workers				
Others				
Trade:				
Journeyman				
Helper				
Apprentices				
Maximum No. of Trainees				
Others				
Trade:				
Journeyman				
Helper				
Apprentices				
Maximum No. of Trainees				
Others				
TOTAL				

*- Lower Income Project Area Residents

Individuals residing in the City/County of _____ whose family income does not exceed 90% of the mean median income of the SMSA.

Company

11.

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

Name of Prime Contractor

Project Number

INSTRUCTIONS:

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

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

SUBCONTRACTOR CERTIFICATION:

Name and Address of Subcontractor (include zip code): _____

1. Subcontractor has participated in a previous contract or subcontract subject to the Equal Opportunity clause.

☐ Yes ☐ No

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

☐ Yes ☐ No

3. Subcontractor has filed all compliance reports due (Date) _____ under applicable instructions, including Monthly Employment Utilization Report (257).

☐ Yes ☐ No ☐ None Required

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

☐ Yes ☐ No

Name and Title of Signer (please print or type)

Signature

Date

12.

CERTIFICATION OF PROPOSED SUBCONTRACTOR REGARDING SECTION 3 AND SEGREGATED FACILITIES

Name of Subcontractor

Project Name

Project Number

The undersigned hereby certifies that:

- a. Section 3 provisions are included in the Contract.
- b. A written Section 3 plan was prepared and submitted as part of the bid proceedings (if bid equals or exceeds \$10,000).
- c. No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

Name and Title of Signer (please print or type)

Signature

Date

CONTRACT FORM

THIS AGREEMENT, made this _____ day of _____, 20____, by and between the (Name of City/Town) herein called "Owner," acting herein through its (Title of Authorized Official), and (Name of Contracting Company) doing business as [a corporation*] hereinafter called "Contractor."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows: _____
for the sum of _____ Dollars (\$ _____); and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his (it's or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by _____; and as enumerated in Paragraph 1 of the Supplemental General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" by the Owner and to fully complete the project within _____ consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of \$ _____ for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract, and to make payments on account thereof as provided in Paragraph 25, Payments to Contractor," of the General Conditions.

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

(SEAL)
ATTEST:

(Administrative Assistant)

(Witness)

(SEAL)
ATTEST:

(Administrative Assistant)

(Witness)

(Owner)

By _____
(Signature of Authorized Official)

(Title of Authorized Official)

(Contractor)

By _____
(Signature of Contractor)

(Title of Contractor)

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

BONDING AND INSURANCE REQUIREMENTS

The Common Rule

A state or local unit of government receiving a grant from the Federal government which requires contracting for construction or facility improvement shall follow its own requirements relating to bid guarantees, performance bonds and payment bonds, except for contracts or subcontracts exceeding \$100,000. For contracts or subcontracts exceeding \$100,000, the Federal agency must make a determination that the Government's interest is adequately protected. If such a determination has not been made, the minimum requirements shall be as follows:

- a. A bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.
- b. A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
- c. A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

Reference 41-16-50 through 41-16-63 of the Code of Alabama of 1975, as amended through the 1981 Regular Session; OMB Circular A-102, Attachment B.

At a minimum a local unit of government or any subdivision thereof receiving a grant from the state/federal government will be required to cause to be furnished the following:

Bid Bonds: All bidders must furnish a bid bond on any contract exceeding \$10,000 and may be required on amounts less than \$10,000 at the discretion of the locality; provided that bonding is available for such services, equipment or materials. The amount of such bond shall be specified in the advertisement for bids except that on contracts exceeding \$100,000 the bid bond shall not be less than five percent of the bid price. See additional requirement for PUBLIC WORKS CONTRACTS.

The bid bond shall consist of a "guarantee" such as a bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.

Performance Bonds: All bidders may be required to furnish a performance bond on any contract. The amount of such bond shall be specified in the advertisement for bids except that on contracts exceeding \$100,000 such bond shall be not less than 100 percent of the contract price. See additional requirement for PUBLIC WORKS CONTRACTS.

A performance bond is one executed in connection with a contract to secure fulfillment of all of the contractor's obligations under such contract.

Payment Bond or Surety Bond: All bidders may be required to furnish a surety or payment bond on any contract. The amount of such bond shall be specified in the advertisement for bids except that on contracts exceeding \$100,000 such bond shall be not less than 100 percent of the contract price. See additional requirements for PUBLIC WORKS CONTRACTS.

A payment bond or surety bond is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

Reference 39-1-1 in its entirety, Code of Alabama of 1982 as amended through the 1981 Regular Session.

Public Works Contracts — For Contracts of \$5,000 to \$99,999: While the foregoing information is applicable on all contracts in the minimums and maximums as specified, there are special requirements for contracts on public works setting certain constraints within those minimums and maximums.

Performance Bonds and Surety or Payment Bonds: Any person, firm or corporation entering into a contract with any county or municipal corporation or subdivision thereof for repair, construction or prosecution of any public buildings or public work, highways, or bridges shall be required, before commencing such work, to execute a performance bond for not less than 100 percent of the contract price, and in addition thereto.

A payment bond with good and sufficient surety is also required, payable to the county or Municipal Corporation or subdivisions letting the contract, in an amount not less than 50 percent of the contract price. The contractor or contractors shall be obligated to promptly make payments to all persons supplying him or them with labor, materials or supplies for or in the prosecution of the work provided for in such contract and for the payment of reasonable attorney's fees incurred by successful claimants or plaintiffs in civil actions on said bond.

The contractor, immediately after the completion of the contract, shall give notice of the completion by publishing the notice for a minimum of three weeks using one or more of the following methods:

- a. In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
- b. On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
- c. On a website used by the awarding authority for publishing notices.

In no instance shall a final settlement be made upon the contract until the expiration of thirty (30) days after completion of the notice.

Proof of publication shall be made by the contractor to the contracting authority by affidavit of the publisher and a printed copy of the notice published. If there is no newspaper published in the county where the work is done, the notice may be given by posting at the courthouse for thirty (30) days, and proof of same shall be made by the probate judge or sheriff and the contractor.

Bid Bonds: All bidders shall furnish a bid bond in an amount not less than five (5) percent of the bid price.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
(Name of Contractor)

_____ a _____,
(Address of Contractor) (Corporation, Partnership or Individual)

herein called Principal, and _____
(Name and Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____
(Name of Owner)

_____ hereinafter called OWNER, in the penal sum of
(Address of Owner)

_____ and _____/100 Dollars (\$ _____) in lawful money of the United States, for the
payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly
by the presents.

THE CONDITION OF THE OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER,
dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part
hereof for the construction of: _____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and
corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract,
and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil gasoline,
coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of
such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by
SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

It is expressly agreed that the Bond shall be deemed amended automatically and immediately, without formal or
separate amendments hereto, upon amendment to the Contract, not increasing the Contract price more than 20% so as
to bind the Principal and the Surety the full faithful performance of the contract as amended.

PROVIDED FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of
time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder of the
SPECIFICATIONS 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 or to
the SPECIFICATIONS.

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

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

(SEAL)
ATTEST:

(Principal)

(Principal Administrative Assistant)

By _____
(Signature of Authorized Official)

(Witness as to Principal)

(Address)

(Address)

(SEAL)
ATTEST:

(Surety)

(Witness as to Surety)

By _____
(Signature of Attorney-in-Fact)

(Address)

(Address)

NOTE: Date of BOND must not be prior to the date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
 (Name of Contractor)

_____ a _____,
 (Address of Contractor) (Corporation, Partnership or Individual)

herein called Principal, and _____
 (Name and Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____
 (Name of Owner)

_____ hereinafter called OWNER, in the penal sum of
 (Address of Owner)

_____ and _____/100 Dollars (\$ _____) in lawful money of the United States, for the
 payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly
 by the presents.

THE CONDITION OF THE OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER,
 dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part
 hereof for the construction of: _____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants,
 terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which
 may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if
 they shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the
 OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the
 OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be
 void; otherwise to remain in full force and effect.

It is expressly agreed that the Bond shall be deemed amended automatically and immediately, without formal or
 separate amendments hereto, upon amendment to the Contract, not increasing the Contract price more than 20% so as
 to bind the Principal and the Surety the full faithful performance of the contract as amended.

PROVIDED FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of
 time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder of the
 SPECIFICATIONS 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 or to
 the SPECIFICATIONS.

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

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20____.

(SEAL)
ATTEST:

(Principal)

(Principal Administrative Assistant)

By _____
(Signature of Authorized Official)

(Witness as to Principal)

(Address)

(Address)

(SEAL)
ATTEST:

(Surety)

(Witness as to Surety)

By _____
(Signature of Attorney-in-Fact)

(Address)

(Address)

NOTE: Date of BOND must not be prior to the date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

17.

NOTICE OF AWARD

TO: _____

PROJECT Description: _____

The OWNER has considered the BID submitted by you for the above described WORK in response to its
Advertisement for Bids dated _____, 20____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of
_____ and _____/100 Dollars, (\$_____).

You are required by the Information of Bidders to execute the Agreement and furnish the required
CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within fifteen (15) calendar days from
the date of this Notice to you.

If you fail to execute said Agreement and to furnish and BONDS within fifteen (15) days from the date of this
Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as
abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by
law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20_____.

(Owner)

(Signature of Owner)

(Title of Owner)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____, this the
_____ day of _____, 20_____.

By: _____

Title: _____

18.

NOTICE TO PROCEED

TO: _____

Date: _____

Project: _____

You are hereby notified to commence WORK in accordance with the Agreement dated_____, 20____, on or before_____, 20____, and you are to complete the WORK within_____consecutive calendar days thereafter. The date of completion of all WORK is therefore_____, 20_____.

(Owner)

(Signature of Owner)

(Title of Owner)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by_____, this the _____ day of _____, 20_____.

By: _____

Title: _____

19.

NOTICE OF START OF CONSTRUCTION

TO: Alabama Department of Economic and Community Affairs

ATTENTION: CDBG Program Supervisor

FROM: _____ / _____
(Sub-recipient) (Project Number)

A bid opening was held on _____ and the contract for _____
(Date) (Project Name/Description)

was awarded to _____ on _____ in the amount of
(Name of Prime Contractor) (Date)

\$ _____.
(Amount)

The debarred status of the prime contractor has been verified and the contractor is eligible to participate in federal programs. The contractor will begin construction on _____. Construction will be completed by _____.
(Date) (Date)

The applicable wage decision is _____. The applicable wage decision was
(Number)
checked ten (10) days prior to the bid opening. There will be a total of _____ prime contractor(s) on this project.
(Number)

(Signature of Mayor/Chairman)

Reminder: This form should be submitted to the State within ten (10) days of the full execution of the prime construction contract(s) along with a copy of the applicable wage decision.

20.

NOTICE OF START OF DEMOLITION

TO: Alabama Department of Economic and Community Affairs

ATTENTION: CDBG Program Supervisor

FROM: _____ / _____
(Sub-recipient) (Project Number)

A bid opening was held on _____ and the contract for _____
(Date) (Project Name/Description)

was awarded to _____ on _____ in the amount of _____
(Name of Prime Contractor) (Date)

\$ _____
(Amount)

The debarred status of the prime contractor has been verified and the contractor is eligible to participate in federal programs. The contractor will begin demolition on _____. Demolition will be completed by _____.
(Date) (Date)

There will be a total of _____ prime contractor(s) on this project.
(Number)

(Signature of Mayor/Chairman)

Reminder: This form should be submitted to ADECA within ten (10) days of the full execution of the prime demolition contract(s).

CHANGE ORDER

Change Order No: _____

Date: _____

Agreement Date: _____

PROJECT #: _____

OWNER: _____

CONTRACTOR: _____

The following changes are hereby made to the CONTRACT DOCUMENTS: _____

Justification: _____

Original CONTRACT AMOUNT: \$ _____

Current CONTRACT AMOUNT (including previous CHANGE ORDER(s), if any): \$ _____

This CHANGE ORDER will (increase) (decrease) the AMOUNT by: \$ _____

The new CONTRACT AMOUNT including this CHANGE ORDER will be \$ _____

Change to CONTRACT TIME: _____

The CONTRACT TIME will be (increased) (decreased) by _____ calendar days.

The date for completion of all WORK will be _____ (Date).

Approvals Required:

To be effective this CHANGE ORDER must be approved by the Federal/State Agency if it changes the scope or objective of the PROJECT, or as may otherwise be required by the SUPPLEMENTAL GENERAL CONDITIONS.

Requested by (Contractor): _____ DATE: _____

Recommended by (Engineer): _____ DATE: _____

Accepted by (Owner): _____ DATE: _____

22.

FINAL SUMMARY CHANGE ORDER

Change Order No: FINAL

Date: _____

Agreement Date: _____

PROJECT #: _____

OWNER: _____

CONTRACTOR: _____

The following changes are hereby made to the CONTRACT DOCUMENTS: _____

Justification: _____

Original CONTRACT AMOUNT: \$ _____

SUMMARY of previous CHANGE ORDER(S) (if any):

CO 1: \$ _____

CO 2: \$ _____

Current CONTRACT AMOUNT (including previous CHANGE ORDER(s), if any): \$ _____

The FINAL SUMMARY CHANGE ORDER will (increase) (decrease) the AMOUNT by: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

Change to CONTRACT TIME: _____

The CONTRACT TIME will be (increased) (decreased) by _____ calendar days.

The date for completion of all WORK will be _____ (Date).

Approvals Required:

To be effective this CHANGE ORDER must be approved by the Federal/State Agency if it changes the scope or objective of the PROJECT, or as may otherwise be required by the SUPPLEMENTAL GENERAL CONDITIONS.

Requested by (Contractor): _____ DATE: _____

Recommended by (Engineer): _____ DATE: _____

Accepted by (Owner): _____ DATE: _____

CERTIFICATION BY OWNER

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

This contract is let in compliance with the provisions of Title 39, Code of Alabama (1975, as amended), and all other applicable provisions of law.

Signature

Title

Date

CERIFICATE OF OWNER'S ATTORNEY

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

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

Signature

Date

25.

FINAL INSPECTION CERTIFICATION

I CERTIFY that I have inspected the _____'s Project Number _____
(Subrecipient) (Project Number)

and it has been completed in accordance with the Drawings and Specifications or other descriptive material.

Appropriate State approval has been given _____, and the Builder's Warranty date is established
(Date of Approval)

as _____.
(Date)

(Contractor's Signature)

(Date)

(Project Engineer's/Architect's Signature)

(Date)

The undersigned gives approval of acceptance of the work constructed under the conditions of the contract and
Builder's Warranty.

(Mayor's/Chairman's Signature)

(Date)

NOTE: This form is to be executed prior to running the Notice of Completion advertisement or holding the Close Out
Public Hearing.

This form must be submitted with the final draw for engineering/architectural and/or the drawdown for final payment
for construction.

In addition to the Final Inspection Certification, the final 2516 form and the final 6002 (Section 3) form must be
submitted. For projects not requiring the Final Inspection Certification, the 2516 and 60002 will still be required.

**ADECA will not process drawdown requests for final payment for the primary activity without the 2516 and 60002
forms.**

BEASON-HAMMON/E-VERIFY CERTIFICATION**GENERAL:**

A. Bidders hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the “Beason-Hammon Alabama Taxpayer and Citizen Protection Act”, or H.B. 658), as amended by Act No. 2012-491, including in part and effective January 1, 2012, enrollment in the E-Verify Program of the United States Department of Homeland Security:

1. Contractor’s signed “E-Verify Memorandum of Understanding” will be required to be attached to any Contract awarded.
2. General Contractors and Subcontractors shall be enrolled in, participate in and maintain compliance for the duration of this contract, and as otherwise required by statute.

B. The following statement shall and will be included in the Contract for Construction:

“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.”

C. Additional information and Guidance is available at the following websites:

1. E-Verify portal maintained by State of Alabama: <http://immigration.alabama.gov>
2. Alabama Office of the Attorney General Website: <http://www.ago.alabama.gov/Page-Immigration>
3. Alabama Building Commission: <http://www.bc.state.al.us/PDFs/Bulletins/GuidanceonAct2012-491-DatedMay-29-2012.pdf>
4. U.S. Department of Homeland Security, E-Verify: <http://www.dhs.gov/E-Verify>

Company ID Number:

THE E-VERIFY MEMORANDUM OF UNDERSTANDING FOR EMPLOYERS

ARTICLE I PURPOSE AND AUTHORITY

The parties to this agreement are the Department of Homeland Security (DHS) and the _____(Employer). The purpose of this agreement is to set forth terms and conditions which the Employer will follow while participating in E-Verify.

E-Verify is a program that electronically confirms an employee's eligibility to work in the United States after completion of Form I-9, Employment Eligibility Verification (Form I-9). This Memorandum of Understanding (MOU) explains certain features of the E-Verify program and describes specific responsibilities of the Employer, the Social Security Administration (SSA), and DHS.

Authority for the E-Verify program is found in Title IV, Subtitle A, of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (IIRIRA), Pub. L. 104-208, 110 Stat. 3009, as amended (8 U.S.C. § 1324a note). The Federal Acquisition Regulation (FAR) Subpart 22.18, "Employment Eligibility Verification" and Executive Order 12989, as amended, provide authority for Federal contractors and subcontractors (Federal contractor) to use E-Verify to verify the employment eligibility of certain employees working on Federal contracts.

ARTICLE II RESPONSIBILITIES

A. RESPONSIBILITIES OF THE EMPLOYER

1. The Employer agrees to display the following notices supplied by DHS in a prominent place that is clearly visible to prospective employees and all employees who are to be verified through the system:
 - a. Notice of E-Verify Participation
 - b. Notice of Right to Work
2. The Employer agrees to provide to the SSA and DHS the names, titles, addresses, and telephone numbers of the Employer representatives to be contacted about E-Verify. The Employer also agrees to keep such information current by providing updated information to SSA and DHS whenever the representatives' contact information changes.
3. The Employer agrees to grant E-Verify access only to current employees who need E-Verify access. Employers must promptly terminate an employee's E-Verify access if the employer is separated from the company or no longer needs access to E-Verify.

Company ID Number:

4. The Employer agrees to become familiar with and comply with the most recent version of the E-Verify User Manual.
5. The Employer agrees that any Employer Representative who will create E-Verify cases will complete the E-Verify Tutorial before that individual creates any cases.
 - a. The Employer agrees that all Employer representatives will take the refresher tutorials when prompted by E-Verify in order to continue using E-Verify. Failure to complete a refresher tutorial will prevent the Employer Representative from continued use of E-Verify.
6. The Employer agrees to comply with current Form I-9 procedures, with two exceptions:
 - a. If an employee presents a "List B" identity document, the Employer agrees to only accept "List B" documents that contain a photo. (List B documents identified in 8 C.F.R. § 274a.2(b)(1)(B)) can be presented during the Form I-9 process to establish identity.) If an employee objects to the photo requirement for religious reasons, the Employer should contact E-Verify at 888-464-4218.
 - b. If an employee presents a DHS Form I-551 (Permanent Resident Card), Form I-766 (Employment Authorization Document), or U.S. Passport or Passport Card to complete Form I-9, the Employer agrees to make a photocopy of the document and to retain the photocopy with the employee's Form I-9. The Employer will use the photocopy to verify the photo and to assist DHS with its review of photo mismatches that employees contest. DHS may in the future designate other documents that activate the photo screening tool.

Note: Subject only to the exceptions noted previously in this paragraph, employees still retain the right to present any List A, or List B and List C, document(s) to complete the Form I-9.

7. The Employer agrees to record the case verification number on the employee's Form I-9 or to print the screen containing the case verification number and attach it to the employee's Form I-9.
8. The Employer agrees that, although it participates in E-Verify, the Employer has a responsibility to complete, retain, and make available for inspection Forms I-9 that relate to its employees, or from other requirements of applicable regulations or laws, including the obligation to comply with the antidiscrimination requirements of section 274B of the INA with respect to Form I-9 procedures.
 - a. The following modified requirements are the only exceptions to an Employer's obligation to not employ unauthorized workers and comply with the anti-discrimination provision of the INA: (1) List B identity documents must have photos, as described in paragraph 6 above; (2) When an Employer confirms the identity and employment eligibility of newly hired employee using E-Verify procedures, the Employer establishes a rebuttable presumption that it has not violated section 274A(a)(1)(A) of the Immigration and Nationality Act (INA) with respect to the hiring of that employee; (3) If the Employer receives a final nonconfirmation for an employee, but continues to employ that person, the Employer must notify DHS and the Employer is subject to a civil money penalty between \$550 and \$1,100 for each failure to notify DHS of continued employment following a final nonconfirmation; (4) If the Employer continues to employ an employee after receiving a final nonconfirmation, then the Employer is subject to a rebuttable presumption that it has knowingly

Company ID Number:

employed an unauthorized alien in violation of section 274A(a)(1)(A); and (5) no E-Verify participant is civilly or criminally liable under any law for any action taken in good faith based on information provided through the E-Verify.

- b. DHS reserves the right to conduct Form I-9 compliance inspections, as well as any other enforcement or compliance activity authorized by law, including site visits, to ensure proper use of E-Verify.

9. The Employer is strictly prohibited from creating an E-Verify case before the employee has been hired, meaning that a firm offer of employment was extended and accepted and Form I-9 was completed. The Employer agrees to create an E-Verify case for new employees within three Employer business days after each employee has been hired (after both Sections 1 and 2 of Form I-9 have been completed), and to complete as many steps of the E-Verify process as are necessary according to the E-Verify User Manual. If E-Verify is temporarily unavailable, the three-day time period will be extended until it is again operational in order to accommodate the Employer's attempting, in good faith, to make inquiries during the period of unavailability.

10. The Employer agrees not to use E-Verify for pre-employment screening of job applicants, in support of any unlawful employment practice, or for any other use that this MOU or the E-Verify User Manual does not authorize.

11. The Employer must use E-Verify for all new employees. The Employer will not verify selectively and will not verify employees hired before the effective date of this MOU. Employers who are Federal contractors may qualify for exceptions to this requirement as described in Article II.B of this MOU.

12. The Employer agrees to follow appropriate procedures (see Article III below) regarding tentative nonconfirmations. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending. Further, when employees contest a tentative nonconfirmation based upon a photo mismatch, the Employer must take additional steps (see Article III.B. below) to contact DHS with information necessary to resolve the challenge.

13. The Employer agrees not to take any adverse action against an employee based upon the employee's perceived employment eligibility status while SSA or DHS is processing the verification request unless the Employer obtains knowledge (as defined in 8 C.F.R. § 274a.1(l)) that the employee is not work authorized. The Employer understands that an initial inability of the SSA or DHS automated verification system to verify work authorization, a tentative nonconfirmation, a case in continuance (indicating the need for additional time for the government to resolve a case), or the finding of a photo mismatch, does not establish, and should not be interpreted as, evidence that the employee is not work authorized. In any of such cases, the employee must be provided a full and fair opportunity to contest the finding, and if he or she does so, the employee may not be terminated or suffer any adverse employment consequences based upon the employee's perceived employment eligibility status.

Company ID Number:

(including denying, reducing, or extending work hours, delaying or preventing training, requiring an employee to work in poorer conditions, withholding pay, refusing to assign the employee to a Federal contract or other assignment, or otherwise assuming that he or she is unauthorized to work) until and unless secondary verification by SSA or DHS has been completed and a final nonconfirmation has been issued. If the employee does not choose to contest a tentative nonconfirmation or a photo mismatch or if a secondary verification is completed and a final nonconfirmation is issued, then the Employer can find the employee is not work authorized and terminate the employee's employment. Employers or employees with questions about a final nonconfirmation may call E-Verify at 1-888-464- 4218 (customer service) or 1-888-897-7781 (worker hotline).

14. The Employer agrees to comply with Title VII of the Civil Rights Act of 1964 and section 274B of the INA as applicable by not discriminating unlawfully against any individual in hiring, firing, employment eligibility verification, or recruitment or referral practices because of his or her national origin or citizenship status, or by committing discriminatory documentary practices. The Employer understands that such illegal practices can include selective verification or use of E-Verify except as provided in part D below, or discharging or refusing to hire employees because they appear or sound "foreign" or have received tentative nonconfirmations. The Employer further understands that any violation of the immigration-related unfair employment practices provisions in section 274B of the INA could subject the Employer to civil penalties, back pay awards, and other sanctions, and violations of Title VII could subject the Employer to back pay awards, compensatory and punitive damages. Violations of either section 274B of the INA or Title VII may also lead to the termination of its participation in E-Verify. If the Employer has any questions relating to the anti-discrimination provision, it should contact OSC at 1-800-255-8155 or 1-800-237-2515 (TDD).

15. The Employer agrees that it will use the information it receives from E-Verify only to confirm the employment eligibility of employees as authorized by this MOU. The Employer agrees that it will safeguard this information, and means of access to it (such as PINS and passwords), to ensure that it is not used for any other purpose and as necessary to protect its confidentiality, including ensuring that it is not disseminated to any person other than employees of the Employer who are authorized to perform the Employer's responsibilities under this MOU, except for such dissemination as may be authorized in advance by SSA or DHS for legitimate purposes.

16. The Employer agrees to notify DHS immediately in the event of a breach of personal information. Breaches are defined as loss of control or unauthorized access to E-Verify personal data. All suspected or confirmed breaches should be reported by calling 1-888-464-4218 or via email at E-Verify@dhs.gov. Please use "Privacy Incident – Password" in the subject line of your email when sending a breach report to E-Verify.

17. The Employer acknowledges that the information it receives from SSA is governed by the Privacy Act (5 U.S.C. § 552a(i)(1) and (3)) and the Social Security Act (42 U.S.C. 1306(a)). Any person who obtains this information under false pretenses or uses it for any purpose other than as provided for in this MOU may be subject to criminal penalties.

18. The Employer agrees to cooperate with DHS and SSA in their compliance monitoring and evaluation of E-Verify, which includes permitting DHS, SSA, their contractors and other agents, upon

Company ID Number:

reasonable notice, to review Forms I-9 and other employment records and to interview it and its employees regarding the Employer's use of E-Verify, and to respond in a prompt and accurate manner to DHS requests for information relating to their participation in E-Verify.

19. The Employer shall not make any false or unauthorized claims or references about its participation in E-Verify on its website, in advertising materials, or other media. The Employer shall not describe its services as federally-approved, federally-certified, or federally-recognized, or use language with a similar intent on its website or other materials provided to the public. Entering into this MOU does not mean that E-Verify endorses or authorizes your E-Verify services and any claim to that effect is false.

20. The Employer shall not state in its website or other public documents that any language used therein has been provided or approved by DHS, USCIS or the Verification Division, without first obtaining the prior written consent of DHS.

21. The Employer agrees that E-Verify trademarks and logos may be used only under license by DHS/USCIS (see [M-795 \(Web\)](#)) and, other than pursuant to the specific terms of such license, may not be used in any manner that might imply that the Employer's services, products, websites, or publications are sponsored by, endorsed by, licensed by, or affiliated with DHS, USCIS, or E-Verify.

22. The Employer understands that if it uses E-Verify procedures for any purpose other than as authorized by this MOU, the Employer may be subject to appropriate legal action and termination of its participation in E-Verify according to this MOU.

B. RESPONSIBILITIES OF FEDERAL CONTRACTORS

1. If the Employer is a Federal contractor with the FAR E-Verify clause subject to the employment verification terms in Subpart 22.18 of the FAR, it will become familiar with and comply with the most current version of the E-Verify User Manual for Federal Contractors as well as the E-Verify Supplemental Guide for Federal Contractors.

2. In addition to the responsibilities of every employer outlined in this MOU, the Employer understands that if it is a Federal contractor subject to the employment verification terms in Subpart 22.18 of the FAR it must verify the employment eligibility of any "employee assigned to the contract" (as defined in FAR 22.1801). Once an employee has been verified through E-Verify by the Employer, the Employer may not create a second case for the employee through E-Verify.

a. An Employer that is not enrolled in E-Verify as a Federal contractor at the time of a contract award must enroll as a Federal contractor in the E-Verify program within 30 calendar days of contract award and, within 90 days of enrollment, begin to verify employment eligibility of new hires using E-Verify. The Employer must verify those employees who are working in the United States, whether or not they are assigned to the contract. Once the Employer begins verifying new hires, such verification of new hires must be initiated within three business days after the hire date. Once enrolled in E-Verify as a Federal contractor, the Employer must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.

Company ID Number:

- b. Employers enrolled in E-Verify as a Federal contractor for 90 days or more at the time of a contract award must use E-Verify to begin verification of employment eligibility for new hires of the Employer who are working in the United States, whether or not assigned to the contract, within three business days after the date of hire. If the Employer is enrolled in E-Verify as a Federal contractor for 90 calendar days or less at the time of contract award, the Employer must, within 90 days of enrollment, begin to use E-Verify to initiate verification of new hires of the contractor who are working in the United States, whether or not assigned to the contract. Such verification of new hires must be initiated within three business days after the date of hire. An Employer enrolled as a Federal contractor in E-Verify must begin verification of each employee assigned to the contract within 90 calendar days after date of contract award or within 30 days after assignment to the contract, whichever is later.
- c. Federal contractors that are institutions of higher education (as defined at 20 U.S.C. 1001(a)), state or local governments, governments of Federally recognized Indian tribes, or sureties performing under a takeover agreement entered into with a Federal agency under a performance bond may choose to only verify new and existing employees assigned to the Federal contract. Such Federal contractors may, however, elect to verify all new hires, and/or all existing employees hired after November 6, 1986. Employers in this category must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.
- d. Upon enrollment, Employers who are Federal contractors may elect to verify employment eligibility of all existing employees working in the United States who were hired after November 6, 1986, instead of verifying only those employees assigned to a covered Federal contract. After enrollment, Employers must elect to verify existing staff following DHS procedures and begin E-Verify verification of all existing employees within 180 days after the election.
- e. The Employer may use a previously completed Form I-9 as the basis for creating an E-Verify case for an employee assigned to a contract as long as:
 - i. That Form I-9 is complete (including the SSN) and complies with Article II.A.6,
 - ii. The employee's work authorization has not expired, and
 - iii. The Employer has reviewed the Form I-9 information either in person or in communications with the employee to ensure that the employee's Section 1, Form I-9 attestation has not changed (including, but not limited to, a lawful permanent resident alien having become a naturalized U.S. citizen).
- f. The Employer shall complete a new Form I-9 consistent with Article II.A.6 or update the previous Form I-9 to provide the necessary information if:
 - i. The Employer cannot determine that Form I-9 complies with Article II.A.6,
 - ii. The employee's basis for work authorization as attested in Section 1 has expired or changed, or
 - iii. The Form I-9 contains no SSN or is otherwise incomplete.

Note: If Section 1 of Form I-9 is otherwise valid and up-to-date and the form otherwise complies with

Company ID Number:

Article II.C.5, but reflects documentation (such as a U.S. passport or Form I-551) that expired after completing Form I-9, the Employer shall not require the production of additional documentation, or use the photo screening tool described in Article II.A.5, subject to any additional or superseding instructions that may be provided on this subject in the E-Verify User Manual.

- g. The Employer agrees not to require a second verification using E-Verify of any assigned employee who has previously been verified as a newly hired employee under this MOU or to authorize verification of any existing employee by any Employer that is not a Federal contractor based on this Article.

3. The Employer understands that if it is a Federal contractor, its compliance with this MOU is a performance requirement under the terms of the Federal contract or subcontract, and the Employer consents to the release of information relating to compliance with its verification responsibilities under this MOU to contracting officers or other officials authorized to review the Employer's compliance with Federal contracting requirements.

C. RESPONSIBILITIES OF SSA

1. SSA agrees to allow DHS to compare data provided by the Employer against SSA's database. SSA sends DHS confirmation that the data sent either matches or does not match the information in SSA's database.
2. SSA agrees to safeguard the information the Employer provides through E-Verify procedures. SSA also agrees to limit access to such information, as is appropriate by law, to individuals responsible for the verification of Social Security numbers or responsible for evaluation of E-Verify or such other persons or entities who may be authorized by SSA as governed by the Privacy Act (5 U.S.C. § 552a), the Social Security Act (42 U.S.C. 1306(a)), and SSA regulations (20 CFR Part 401).
3. SSA agrees to provide case results from its database within three Federal Government work days of the initial inquiry. E-Verify provides the information to the Employer.
4. SSA agrees to update SSA records as necessary if the employee who contests the SSA tentative nonconfirmation visits an SSA field office and provides the required evidence. If the employee visits an SSA field office within the eight Federal Government work days from the date of referral to SSA, SSA agrees to update SSA records, if appropriate, within the eight-day period unless SSA determines that more than eight days may be necessary. In such cases, SSA will provide additional instructions to the employee. If the employee does not visit SSA in the time allowed, E-Verify may provide a final nonconfirmation to the employer.

Note: If an Employer experiences technical problems, or has a policy question, the employer should contact E-Verify at 1-888-464-4218.

D. RESPONSIBILITIES OF DHS

1. DHS agrees to provide the Employer with selected data from DHS databases to enable the Employer to conduct, to the extent authorized by this MOU:
 - a. Automated verification checks on alien employees by electronic means, and

Company ID Number:

- b. Photo verification checks (when available) on employees.
2. DHS agrees to assist the Employer with operational problems associated with the Employer's participation in E-Verify. DHS agrees to provide the Employer names, titles, addresses, and telephone numbers of DHS representatives to be contacted during the E-Verify process.
3. DHS agrees to provide to the Employer with access to E-Verify training materials as well as an E-Verify User Manual that contain instructions on E-Verify policies, procedures, and requirements for both SSA and DHS, including restrictions on the use of E-Verify.
4. DHS agrees to train Employers on all important changes made to E-Verify through the use of mandatory refresher tutorials and updates to the E-Verify User Manual. Even without changes to E-Verify, DHS reserves the right to require employers to take mandatory refresher tutorials.
5. DHS agrees to provide to the Employer a notice, which indicates the Employer's participation in E-Verify. DHS also agrees to provide to the Employer anti-discrimination notices issued by the Office of Special Counsel for Immigration-Related Unfair Employment Practices (OSC), Civil Rights Division, U.S. Department of Justice.
6. DHS agrees to issue each of the Employer's E-Verify users a unique user identification number and password that permits them to log in to E-Verify.
7. DHS agrees to safeguard the information the Employer provides, and to limit access to such information to individuals responsible for the verification process, for evaluation of E-Verify, or to such other persons or entities as may be authorized by applicable law. Information will be used only to verify the accuracy of Social Security numbers and employment eligibility, to enforce the INA and Federal criminal laws, and to administer Federal contracting requirements.
8. DHS agrees to provide a means of automated verification that provides (in conjunction with SSA verification procedures) confirmation or tentative nonconfirmation of employees' employment eligibility within three Federal Government work days of the initial inquiry.
9. DHS agrees to provide a means of secondary verification (including updating DHS records) for employees who contest DHS tentative nonconfirmations and photo mismatch tentative nonconfirmations. This provides final confirmation or nonconfirmation of the employees' employment eligibility within 10 Federal Government work days of the date of referral to DHS, unless DHS determines that more than 10 days may be necessary. In such cases, DHS will provide additional verification instructions.

ARTICLE III REFERRAL OF INDIVIDUALS TO SSA AND DHS

A. REFERRAL TO SSA

1. If the Employer receives a tentative nonconfirmation issued by SSA, the Employer must print the notice as directed by E-Verify. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify

Company ID Number:

case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.

2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.
3. After a tentative nonconfirmation, the Employer will refer employees to SSA field offices only as directed by E-Verify. The Employer must record the case verification number, review the employee information submitted to E-Verify to identify any errors, and find out whether the employee contests the tentative nonconfirmation. The Employer will transmit the Social Security number, or any other corrected employee information that SSA requests, to SSA for verification again if this review indicates a need to do so.
4. The Employer will instruct the employee to visit an SSA office within eight Federal Government work days. SSA will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.
5. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.
6. The Employer agrees not to ask the employee to obtain a printout from the Social Security Administration number database (the Numident) or other written verification of the SSN from the SSA.

B. REFERRAL TO DHS

1. If the Employer receives a tentative nonconfirmation issued by DHS, the Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.
2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.
3. The Employer agrees to refer individuals to DHS only when the employee chooses to contest a tentative nonconfirmation.
4. If the employee contests a tentative nonconfirmation issued by DHS, the Employer will instruct the

Company ID Number:

employee to contact DHS through its toll-free hotline (as found on the referral letter) within eight Federal Government work days.

5. If the Employer finds a photo mismatch, the Employer must provide the photo mismatch tentative nonconfirmation notice and follow the instructions outlined in paragraph 1 of this section for tentative nonconfirmations, generally.

6. The Employer agrees that if an employee contests a tentative nonconfirmation based upon a photo mismatch, the Employer will send a copy of the employee's Form I-551, Form I-766, U.S. Passport, or passport card to DHS for review by:

- a. Scanning and uploading the document, or
- b. Sending a photocopy of the document by express mail (furnished and paid for by the employer).

7. The Employer understands that if it cannot determine whether there is a photo match/mismatch, the Employer must forward the employee's documentation to DHS as described in the preceding paragraph. The Employer agrees to resolve the case as specified by the DHS representative who will determine the photo match or mismatch.

8. DHS will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.

9. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.

ARTICLE IV SERVICE PROVISIONS

A. NO SERVICE FEES

1. SSA and DHS will not charge the Employer for verification services performed under this MOU. The Employer is responsible for providing equipment needed to make inquiries. To access E-Verify, an Employer will need a personal computer with Internet access.

ARTICLE V MODIFICATION AND TERMINATION

A. MODIFICATION

1. This MOU is effective upon the signature of all parties and shall continue in effect for as long as the SSA and DHS operates the E-Verify program unless modified in writing by the mutual consent of all parties.

2. Any and all E-Verify system enhancements by DHS or SSA, including but not limited to E-Verify checking against additional data sources and instituting new verification policies or procedures, will be covered under this MOU and will not cause the need for a supplemental MOU that outlines these changes.

Company ID Number:

B. TERMINATION

1. The Employer may terminate this MOU and its participation in E-Verify at any time upon 30 days prior written notice to the other parties.
2. Notwithstanding Article V, part A of this MOU, DHS may terminate this MOU, and thereby the Employer's participation in E-Verify, with or without notice at any time if deemed necessary because of the requirements of law or policy, or upon a determination by SSA or DHS that there has been a breach of system integrity or security by the Employer, or a failure on the part of the Employer to comply with established E-Verify procedures and/or legal requirements. The Employer understands that if it is a Federal contractor, termination of this MOU by any party for any reason may negatively affect the performance of its contractual responsibilities. Similarly, the Employer understands that if it is in a state where E-Verify is mandatory, termination of this by any party MOU may negatively affect the Employer's business.
3. An Employer that is a Federal contractor may terminate this MOU when the Federal contract that requires its participation in E-Verify is terminated or completed. In such cases, the Federal contractor must provide written notice to DHS. If an Employer that is a Federal contractor fails to provide such notice, then that Employer will remain an E-Verify participant, will remain bound by the terms of this MOU that apply to non-Federal contractor participants, and will be required to use the E-Verify procedures to verify the employment eligibility of all newly hired employees.
4. The Employer agrees that E-Verify is not liable for any losses, financial or otherwise, if the Employer is terminated from E-Verify.

ARTICLE VI PARTIES

- A. Some or all SSA and DHS responsibilities under this MOU may be performed by contractor(s), and SSA and DHS may adjust verification responsibilities between each other as necessary. By separate agreement with DHS, SSA has agreed to perform its responsibilities as described in this MOU.
- B. Nothing in this MOU is intended, or should be construed, to create any right or benefit, substantive or procedural, enforceable at law by any third party against the United States, its agencies, officers, or employees, or against the Employer, its agents, officers, or employees.
- C. The Employer may not assign, directly or indirectly, whether by operation of law, change of control or merger, all or any part of its rights or obligations under this MOU without the prior written consent of DHS, which consent shall not be unreasonably withheld or delayed. Any attempt to sublicense, assign, or transfer any of the rights, duties, or obligations herein is void.
- D. Each party shall be solely responsible for defending any claim or action against it arising out of or related to E-Verify or this MOU, whether civil or criminal, and for any liability wherefrom, including (but not limited to) any dispute between the Employer and any other person or entity regarding the applicability of Section 403(d) of IIRIRA to any action taken or allegedly taken by the Employer.
- E. The Employer understands that its participation in E-Verify is not confidential information and may be disclosed as authorized or required by law and DHS or SSA policy, including but not limited to,

Company ID Number:

Congressional oversight, E-Verify publicity and media inquiries, determinations of compliance with Federal contractual requirements, and responses to inquiries under the Freedom of Information Act (FOIA).

F. The individuals whose signatures appear below represent that they are authorized to enter into this MOU on behalf of the Employer and DHS respectively. The Employer understands that any inaccurate statement, representation, data or other information provided to DHS may subject the Employer, its subcontractors, its employees, or its representatives to: (1) prosecution for false statements pursuant to 18 U.S.C. 1001 and/or; (2) immediate termination of its MOU and/or; (3) possible debarment or suspension.

G. The foregoing constitutes the full agreement on this subject between DHS and the Employer.

To be accepted as an E-Verify participant, you should only sign the Employer's Section of the signature page. If you have any questions, contact E-Verify at 1-888-464-4218.

Company ID Number:

Approved by:

Employer	
Name (Please Type or Print)	Title
Signature	Date
Department of Homeland Security – Verification Division	
Name (Please Type or Print)	Title
Signature	Date

Company ID Number:

Information Required for the E-Verify Program	
Information relating to your Company:	
Company Name	
Company Facility Address	
Company Alternate Address	
County or Parish	
Employer Identification Number	
North American Industry Classification Systems Code	
Parent Company	
Number of Employees	
Number of Sites Verified for	

Are you verifying for more than 1 site? If yes, please provide the number of sites verified for in each State:

[illegible][illegible]

Company ID Number:

Information relating to the Program Administrator(s) for your Company on policy questions or operational problems:

Company ID Number:

State of _____)
County of _____)

CERTIFICATE OF COMPLIANCE WITH THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT

(ACT 2011-535, as amended by ACT 2012-491)

DATE: _____

RE Contract/Grant/Incentive (describe by number or subject):

_____ by and between
_____ (Contractor/Grantee) and
_____ (State Agency, Department or Public Entity)

The undersigned hereby certifies to the State of Alabama as follows:

1. The undersigned holds the position of _____ with the Contractor/Grantee named above, and is authorized to provide representations set out in this Certificate as the official and binding act of that entity, and has knowledge of the provisions of THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535 of the Alabama Legislature, as amended by ACT 2012-491) which is described herein as "the Act."
2. Using the following definitions from Section 3 of the Act, select and initial either (a) or (b), below, to describe the Contractor/Grantee's business structure.

BUSINESS ENTITY. Any person or group of persons employing one or more persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood, whether for profit or not for profit.

- a. Self-employed individuals, business entities filing articles of incorporation, partnerships, limited partnerships, limited liability companies, foreign corporations, foreign limited partnerships, and foreign limited liability companies authorized to transact business in this state, business trusts, and any business entity that registers with the Secretary of State.
- b. Any business entity that possesses a business license, permit, certificate, approval, registration, charter, or similar form of authorization issued by the state, any business entity that is exempt by law from obtaining such a business license, and any business entity that is operating unlawfully without a business license.

EMPLOYER. Any person, firm, corporation, partnership, joint stock association, agent, manager, representative, foreman, or other person having control or custody of any employment, place of employment, or of any employee, including any person or entity employing any person for hire within the State of Alabama, including a public employer. This term shall not include the occupant of a household contracting with another person to perform casual domestic labor within the household.

_____ (a) The Contractor/Grantee is a business entity or employer as those terms are defined in Section 3 of the Act.

_____ (b) The Contractor/Grantee is not a business entity or employer as those terms are defined in Section 3 of the Act.

3. As of the date of this Certificate, the Contractor/Grantee does not knowingly employ an unauthorized alien within the State of Alabama and hereafter it will not knowingly employ, hire for employment, or continue to employ and unauthorized alien within the State of Alabama;
4. The Contractor/Grantee is enrolled in the E-Verify unless it is not eligible to enroll because of the rules of that program or other factors beyond its control.

Certified this _____ day of _____, 20_____.

Name of Contractor/Grantee/Recipient

By: _____

Its _____

The above Certification was signed in my presence by the person whose name appears above, on this _____ day of _____, 20_____.

WITNESS: _____

Printed Name of Witness

GENERAL CONDITIONS

Table of Contents

1. Contract and Contract Documents	49. Photographs of the Project
2. Definitions	50. Suspension of Work
3. Additional Instructions and Detail Drawings	51. HUD 4010 Federal Labor Standards
4. Shop or Setting Drawings	
5. Materials, Services and Facilities	
6. Contractor's Title to Materials	
7. Inspection and Testing of Materials	
8. "Or Equal" Clause	
9. Patents	
10. Surveys, Permits and Regulations	
11. Contractor's Obligations	
12. Weather Conditions	
13. Protection of Work and Property - Emergency	
14. Inspection	
15. Reports, Records and Data	
16. Superintendence by Contractor	
17. Changes in Work	
18. Extras	
19. Time for Completion and Liquidated Damages	
20. Correction of Work	
21. Subsurface Conditions Found Different	
22. Claims for Extra Cost	
23. Right of Owner to Terminate Contract	
24. Construction Schedule and Periodic Estimates	
25. Payments to Contractor	
26. Acceptance of Final Payment Constitutes Release	
27. Payments by Contractor	
28. Insurance	
29. Contract Security	
30. Additional or Substitute Bond	
31. Assignments	
32. Mutual Responsibility of Contractors	
33. Separate Contracts	
34. Subcontracting	
35. Architect/Engineer's Authority	
36. Stated Allowances	
37. Use of Premises and Removal of Debris	
38. Quantities of Estimate	
39. Lands and Rights-of-Way	
40. General Guaranty	
41. Conflicting Conditions	
42. Notice and Service Thereof	
43. Provisions Required by Law Deemed Inserted	
44. Protection of Lives and Health	
45. Subcontracts	
46. Interest of Member of Congress	
47. Other Prohibited Interests	
48. Use Prior to Owner's Acceptance	

GENERAL CONDITIONS
Including Federal Labor Standards Provisions

1. **Contract and Contract Documents:** The project to be constructed and pursuant to this Contract will be financed with assistance from the Alabama Community Development Block Grant Program and is subject to all applicable laws.

The plans, specifications and addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions of Page 66, shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The tables of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. **Definitions:** The following terms as used in the contract are respectively defined as follows:
 - a. "Contractor": A person, firm or corporation with whom the contract is made by the Owner.
 - b. "Subcontractor": A person, firm or corporation supplying labor and materials or only labor for work at the site of the project for, and under separate contract or agreement with, the Contractor.
 - c. "Work on (at) the project": Work to be performed at the location of the project, including the transportation of materials and supplies to or from the location of the project by employees of the Contractor and any Subcontractor.
3. **Additional Instructions and Detail Drawings:** The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Architect/Engineer will prepare jointly (a) a schedule, fixing the dates at which special detail drawings will be required, such drawings, if any, to be furnished by the Architect/Engineer in accordance with said schedule, and (b) a schedule fixing the respective dates for the submission of shop drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment, and the completion of the various parts of the work; each such schedule to be subject to change from time to time in accordance with the progress of the work.
4. **Shop or Setting Drawings:** The Contractor shall submit promptly to the Architect/Engineer two copies of each shop or setting drawing prepared in accordance with the schedule predetermined as aforesaid. After examination of such drawings by the Architect/Engineer and the return thereof, the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Architect/Engineer with two corrected copies. If requested by the Architect/Engineer the Contractor must furnish additional copies. Regardless of corrections made in or approval given to such drawings by the Architect/Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the plans and specifications, unless he notifies the Architect/Engineer in writing of any deviations at the time he furnishes such drawings.
5. **Materials, Services and Facilities:**
 - a. It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation,

superintendence, temporary construction of every nature and all other services and facilities of every nature whatsoever necessary to execute, complete and deliver the work within the specified time.

- b. Any work necessary to be performed after regular working hours, on Sunday or Legal Holidays, shall be performed without additional expense to the Owner.

6. **Contractor's Title to Materials:** No materials or supplies for the work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

7. **Inspection and Testing of Materials:**

- a. All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. The Owner will pay for all laboratory inspection service direct, and not as a part of the Contract.
- b. Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.

8. **"Or Equal" Clause:** Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and, any materials, article or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article or equipment so proposed, is, in the opinion of the Architect/Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

9. **Patents:**

- a. The Contractor shall hold and save the Owner and its officers, agents, servants and employees harmless from liability of any nature or kind, including cost 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 Documents.
- b. License or Royalty Fees: License and/or royalty fees for the use of a process which is authorized by the Owner of the project must be reasonable, and paid to the holder of the patent, or its authorized licensee, direct by the Owner and not by or through the Contractor.
- c. If the Contractor uses any design, device or materials covered by letters, patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or its Sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

10. **Surveys, Permits and Regulations:** Unless otherwise expressly provided for in the specifications, the Owner will furnish to the Contractor all surveys necessary for the execution of the work.

The Contractor shall procure and pay all permits, licenses and approvals necessary for the execution of its contract.

The Contractor shall comply with all laws, ordinances, rules, orders and regulations relating to performance of the work, the protection of adjacent property and the maintenance of passageways, guard fences or other protective facilities.

11. **Contractor's Obligations:** The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this Contract, within the time herein specified, in accordance with the provisions of this Contract and said specifications and in accordance with the plans and drawings covered by this Contract any and all supplemental plans and drawings, and in accordance with directions of the Architect/Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required.

The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of the Contract and specifications, and shall do, carry on and complete the entire work to the satisfaction of the Architect/Engineer and the Owner.

12. **Weather Conditions:** In the event of temporary suspension of work, or during inclement weather, or whenever the Architect/Engineer shall direct, the Contractor will, and will cause its Subcontractors to protect carefully its and their work and materials against damage or injury from the weather. If, in the opinion of the Architect/Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of its Subcontractors so to protect its work, such materials shall be removed and replaced at the expense of the Contractor.

13. **Protection of Work and Property – Emergency:** The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Contract. He shall at all times safely guard and protect its own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the Contract or by the Owner, or its duly authorized representatives.

In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Architect/Engineer, in a diligent manner. He shall notify the Architect/Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Architect/Engineer for approval. Where the Contractor has not taken action but has notified the Architect/Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Architect/Engineer.

The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Paragraph 17 of the General Conditions.

14. **Inspection:** The authorized representatives and agents of the ADECA and the Department of Housing and Urban Development shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other relevant data and records.
15. **Reports, Records and Data:** The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this Contract. All records must be maintained not less than five (5) years from the conclusion of this project.

16. **Superintendence by Contractor:** At the site of the work, the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Architect/Engineer and shall be one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.
17. **Changes in Work:** No changes in the work covered by the approved Contract Documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:
- a. Unit bid prices previously approved.
 - b. An agreed lump sum.
 - c. The actual cost of:
 - i. Labor, including foremen.
 - ii. Materials entering permanently into the work.
 - iii. The ownership or rental cost of construction plant and equipment during the time of use on the extra work.
 - iv. Power and consumable supplies for the operation of power equipment.
 - v. Insurance
 - vi. Social security and old age and unemployment contributions.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit, and any other general expenses.

18. **Extras:** Without invalidating the Contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or its Architect/Engineer, acting officially for the Owner, and the price is stated in such order.
19. **Time for Completion and Liquidated Damages:** It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the "Notice to Proceed."

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

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

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such

event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

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

- a. To any preference, priority or allocation order duly issued by the Government.
- b. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather.
- c. To any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article.

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

20. **Correction of Work:** All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be at all times and places subject to the inspection of the Architect/Engineer who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture and methods of construction for the purposes for which they are used. Should they fail to meet their approval they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at their own expense. Rejected materials shall immediately be removed from the site. If, in the opinion of the Architect/Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as in the judgment of the Architect/Engineer shall be equitable.
21. **Subsurface Conditions Found Different:** Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Architect/Engineer of such conditions before they are disturbed. The Architect/Engineer will thereupon promptly investigate the conditions, and if he finds that they materially differ from those shown on the plans or indicated in the specifications, he will at once make such changes in the plans and/or specifications as he may find necessary, any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in Paragraph 17 of the General Conditions.
22. **Claims for Extra Cost:** No claim for extra work or cost shall be allowed unless the same was done in pursuance of a written order of the Architect/Engineer approved by the Owner, as aforesaid, and the claim presented with the first estimate after the changed or extra work is done. When work is performed under the terms of subparagraph 17(c) of the General Conditions, the Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

23. **Right of Owner to Terminate Contract:** In the event that any of the provisions of this Contract are violated by the Contractor, or by any of its Subcontractors, the Owner may serve written notice upon the Contractor and Surety of its intention to terminate the Contract, such notices to contain the reasons for such intention to terminate the Contract, and unless within ten (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the Contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor and the Surety shall have the right to take over and perform the Contract; provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and its Surety shall be liable to the Owner for any excess cost occasioned by the Owner thereby, and in such event 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.
24. **Construction Schedule and Periodic Estimates:** Immediately after execution and delivery of the Contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish on forms to be supplied by the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.
25. **Payment to Contractor:**
- a. Not later than the _____ day of each calendar month the Owner shall make a progress payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this Contract, but to insure the proper performance of this contract, the Owner shall retain five percent (5%) of the amount of each estimate until fifty percent (50%) completion and acceptance of the work covered by this Contract; provided, that the Contractor shall submit its estimate not later than the _____ day of the month; provided, further, that on completion and acceptance of each separate building, public work, or other division of the Contract, on which the price is stated separately in the Contract, payment may be made in full, including retained percentages thereon, less authorized deductions.
 - b. In preparing estimates, the material delivered on the site and preparatory work done may be taken into consideration.
 - c. All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.
 - d. **Owner's Right to Withhold Certain Amounts and Make Application Thereof:** The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen and furnishers of machinery and parts thereof, equipment, power tools and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all

such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or its Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the Contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

26. **Acceptance of Final Payment Constitutes Release:** The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or its Sureties from any obligations under this Contract or the performance and payment bond.
27. **Payments by Contractor:** The Contractor shall pay:
- a. For all transportation and utility services not later than the _____ day of the calendar month following that in which services are rendered,
 - b. For all materials, tools and other expendable equipment to the extent of ninety percent (90%) of the cost thereof, not later than the _____ day of the calendar month following that in which such materials, tools and equipment are delivered at the site of the project, and the balance of the cost thereof, not later than the day following the completion of that part of the work in or on which such materials, tools and equipment are incorporated or used, and
 - c. To each of its Subcontractors, not later than the _____ day following each payment to the Contractor, the respective amount allowed the Contractor on account of the work performed by its Subcontractors to the extent of each Subcontractor's interest therein.
28. **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. **Compensation Insurance:** The Contractor shall procure and shall maintain during the life of this Contract Workmen's Compensation Insurance as required by applicable State or territorial law for all of its 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 Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this Contract is not protected under the Workmen'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 its employees as are not otherwise protected.
 - b. **Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance:** The Contractor shall procure and shall maintain during the life of this Contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the amounts specified in the Supplemental General Conditions.
 - c. **Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance:** The Contractor shall either (1) require each of its Subcontractors to procure and to maintain during the life of its subcontract, Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in the Supplemental General Conditions specified in subparagraph (b) hereof, or (2) insure the activities of its 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 its Subcontractors, 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 as enumerated in the Supplemental General Conditions.
 - e. Builder's Risk Insurance (Fire and Extended Coverage): Until the project is completed and accepted by the Owner, the Owner or Contractor (at the Owner's option as indicated in the Supplemental General Conditions) is required to maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent (100%) completed value basis on the insurable portion of the project for the benefit of the Owner, the Contractor, and Subcontractors as their interests may appear. The Contractor shall not include any costs for Builder's Risk Insurance (fire and extended coverage) premiums during construction unless the Contractor is required to provide such insurance; however, this provision shall not release the Contractor from its obligation to complete, according to plans and specifications, the project covered by the Contract, and the Contractor and its Surety shall be obligated to full performance of the Contractor's undertaking.
 - f. Proof of Carriage of 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 ten (10) days written notice has been received by the Owner."
29. **Contract Security**: The Contractor shall furnish a performance bond in an amount at least equal to 100 percent (100%) of the contract prices as security for the faithful performance of this Contract and also a payment bond in an amount not less than 100 percent (100%) of the contract price or in a penal sum not less than that prescribed by State, territorial or local law, as security for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law.
30. **Additional or Substitute Bond**: If at any time the Owner for justifiable cause shall be or become dissatisfied with any Surety or Sureties, then upon the performance or payment bonds, the Contractor shall within five (5) days after notice from the Owner so to do, substitute an acceptable bond (or bonds) in such form and sum and signed by such other Surety or Sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new Surety or Sureties shall have furnished such an acceptable bond to the Owner.
31. **Assignments**: The Contractor shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of the monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract.
32. **Mutual Responsibilities of Contractors**: If, through acts of neglect on the part of the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

33. **Separate Contracts:** The Contractor shall coordinate its operations with those of other Contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including its Subcontractors, shall keep informed of the progress and the detail work of other Contractors and shall notify the Architect/Engineer immediately of lack of progress or defective workmanship on the part of other Contractors. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with its own work.

34. **Subcontracting:**

- a. The Contractor may utilize the services of specialty Subcontractors on those parts of the work which, under normal contracting practices are performed by specialty Subcontractors.
- b. The Contractor shall not award any work to any Subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the Subcontractor, which statement shall contain such information as the Owner may require.
- c. The Contractor shall be as fully responsible to the Owner for the acts and omissions of its Subcontractors, 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 Subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.
- e. Nothing contained in this Contract shall create any contractual relation between any Subcontractor and the Owner.

35. **Architect/Engineer's Authority:** The Architect/Engineer shall give all orders and directions contemplated under this Contract and specifications, relative to the execution of the work. The Architect/Engineer shall determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this Contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Architect/Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said Contract and specifications, the determination or decision of the Architect/Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this Contract affected in any manner or to any extent by such question.

The Architect/Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor under this Contract and other Contractors performing work for the Owner shall be adjusted and determined by the Architect/Engineer.

36. **Stated Allowances:** The Contractor shall include in its proposal the cash allowances stated in the Supplemental General Conditions. The Contractor shall purchase the "Allowed Materials" as directed by the Owner on the basis of the lowest and best bid of at least three (3) competitive bids. If the actual price for purchasing the "Allowed Materials" is more or less than the "Cash Allowance," the contract price shall be adjusted accordingly. The adjustment in contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "Allowed Materials" shall be included in the applicable sections of the Contract Specifications covering this work.

37. **Use of Premises and Removal of Debris:** The contractor expressly undertakes at its own expense:

- a. To take every precaution against injuries to persons or damage to property.
- b. To store its apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of its work or the work of any other Contractors.
- c. To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.
- d. To clean up frequently all refuse, rubbish, scrap materials and debris caused by its operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance.
- e. Before final payment to remove all surplus material, false-work, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from its operations, and to put the site in a neat, orderly condition.
- f. To affect all cutting, fitting or patching of its work required to make the same to conform to the plans and specifications and, except with the consent of the Architect/Engineer, not to cut or otherwise alter the work of any other Contractor.

38. **Quantities of Estimate:** Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract, and such increase or diminution shall in no way vitiate this Contract, nor shall any such increase or diminution give cause for claims or liability for damages.
39. **Lands and Rights-of-Way:** Prior to the start of construction, the Owner shall obtain all lands and rights-of-way necessary for the carrying out and completion of work to be performed under this Contract.
40. **General Guaranty:** Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects 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 Owner will give notice of observed defects with reasonable promptness.
41. **Conflicting Conditions:** Any provisions in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in these General Conditions shall be void to the extent of such conflict or inconsistency.
42. **Notice and Service Thereof:** Any notice to any Contractor from the Owner relative to any part of this Contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by certified or registered mail, to the said Contractor at its last given address, or delivered in person to the said Contractor or its authorized representative on the work.
43. **Provisions Required by Law Deemed Inserted:** Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion or correction.
44. **Protection of Lives and Health:** "The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of its prosecution of the work. The safety provisions of applicable laws and building and construction codes, in addition to specific safety and health regulations described by Chapter XIII, Bureau of Labor Standards, Department of Labor, Part 1518, Safety and Health Regulations for Construction, as outlined

in the Federal Register, Volume 36, No.75, Saturday, April 17, 1971. Title 29 — LABOR, shall be observed and the Contractor shall take or cause to be taken, such additional safety and health measures as the Contracting Authority may determine to be reasonably necessary.”

45. **Subcontracts:** The Contractor will insert in any subcontracts the Federal Labor Standards Provisions contained herein and such other clauses as the Department of Housing and Urban Development may, by instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.
46. **Interest of Member of or Delegate of Congress:** No member of or delegate to Congress, or Resident Commissioner shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.
47. **Other Prohibited Interests:** No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract or any other contract pertaining to the project.
48. **Use and Occupancy Prior to Acceptance by Owner:** The Contractor agrees to the use and occupancy of a portion or unit of the project before formal acceptance by the Owner, provided the Owner:
- a. Secures written consent of the Contractor except in the event, in the opinion of the Architect/Engineer, the Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other Contract requirements.
 - b. Secures endorsement from the insurance-carrier and consent of the surety permitting occupancy of the building or use of the project during the remaining period of construction.

OR

- c. When the project consists of more than one building, and one of the buildings is occupied, secures permanent fire and extended coverage insurance, including a permit to complete construction. Consent of the surety must also be obtained.
49. **Photographs of the Project:** If required by the Owner, the Contractor shall furnish photographs of the project, in the quantities and as described in the Supplemental General Conditions.
50. **Suspension of Work:** Should the Owner be prevented or enjoined from proceeding with work either before or after the start of construction by reason of any litigation or other reason beyond the control of the Owner, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay; but time for completion of the work will be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay with such determination to be set forth in writing.

51. FEDERAL LABOR STANDARDS PROVISIONS

U.S. Department of
Housing and Urban Development
Applicability

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

1. (i) **Minimum Wages.** All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a) (1) (iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a) (4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a) (1) (ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met.

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (4) As a prerequisite for approval of a helper classification, the helper classification must prevail in the area where the work is performed.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administration of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

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

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

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account asset for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. **Withholding.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor of any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, (HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis—Bacon Act contracts.
3. (i) **Payrolls and basic records.** Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates or wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(1) (1) (iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b) (2) (B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the

registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a) (3) (i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149).

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

- (1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a) (3) (i) and that such information is correct and complete;
- (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;
- (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

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

(d)) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

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

4. (i) **Apprentices and Trainees.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios

and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii)) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

(iv) Helpers. The permissible ratio of helpers to journeymen on a project is up to two helpers for every three journeymen. If the helper classification is specified on a contract wage determination or is approved pursuant to the conformance procedure. To ensure that this ratio does not disrupt existing established local practices in areas where wage determinations have previously contained helper classifications without any limitation on the number permitted, DOL will consider requests for variances from the ratio limitation prior to bid opening on a contract. The variance request will be approved if supported by a showing that the Davis-Bacon wage determination in effect for the type of construction in the area before the effective date of the final helper regulations contained a helper classification, and that there was a practice in the area of utilizing such helpers in excess of the two-to-three ratio on projects to which the Davis-Bacon and Related Acts applied.

5. **Compliance with Copeland Act Requirements.** The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.
6. **Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.5(a) (1) through (10) and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.
7. **Contracts termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.
10. (i) **Certification of Eligibility.** By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a) (1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
- (ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act of 29 CFR or 29 CFR 5.12(a) (1) or to be awarded HUD contracts or participate in HUD program pursuant to 24 CFR Part 24.
- (iii)) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions," provides in part "Whoever, for the purpose of... influencing in any way the action of such Administration... makes, utters or publishes any statement, knowing the same to be false... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."
11. **Complaints, Proceedings, or Testimony by Employees.** No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to its employer.
12. **Contract Work Hours and Safety Standards Act.** As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.
- (i) **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involved the employment of laborers, or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (ii) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in subparagraph (i) of this paragraph, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (i) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (i) of this paragraph.
- (iii) **Withholding for unpaid wages and liquidated damages.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account or work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (ii) of this paragraph.
- (iv) **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (i) through (iv) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any

subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (i) through (iv) of this paragraph.

13. Health and Safety.

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

(ii)) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat.96).

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

28.

SUPPLEMENTAL GENERAL CONDITIONS
Including Equal Opportunity Provisions

1. Enumeration of Plans, Specifications and Addenda
2. Stated Allowances
3. Special Hazards
4. Contractor's and Subcontractor's Public Liability, Vehicle Liability and Property Damage Insurance
5. Photographs of Project
6. Schedule of Occupational Classifications and Minimum Hourly Wage Rates
7. Builder's Risk Insurance
8. Special Equal Opportunity Provisions
9. Certification of Compliance with Air and Water Acts
10. Special Conditions Pertaining to Hazards, Safety Standards and Accident Prevention
11. Wage Rate Determination(s)

1. **Enumeration of Plans, Specifications and Addenda:** Following are the Plans, Specification and Addenda which form a part of this Contract, as set forth in paragraph 1 of the General Conditions, "Contracts and Contract Documents":

DRAWINGS:

General Construction: Nos. _____

Heating and Ventilating: Nos. _____

Plumbing: Nos. _____

Electrical: Nos. _____

_____ Nos. _____

_____ Nos. _____

SPECIFICATIONS:

General Construction: Page _____ to _____, inclusive

Heating and Ventilating: Page _____ to _____, inclusive

Plumbing: Page _____ to _____, inclusive

Electrical: Page _____ to _____, inclusive

_____ Page _____ to _____, inclusive

_____ Page _____ to _____, inclusive

ADDENDA:

No. _____ Date _____ No. _____ Date _____

No. _____ Date _____ No. _____ Date _____

2. **Stated Allowances:** Pursuant to paragraph 36 of the General Conditions, the Contractor shall include the following cash allowances in their proposal:

a. For _____ (Page _____ of Specifications) \$ _____

b. For _____ (Page _____ of Specifications) \$ _____

c. For _____ (Page _____ of Specifications) \$ _____

d. For _____ (Page _____ of Specifications) \$ _____

e. For _____ (Page _____ of Specifications) \$ _____

f. For _____ (Page _____ of Specifications) \$ _____

3. **Special Hazards:** The Contractor's and its Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against the following special hazards:

4. **Contractor's and Subcontractor's Public Liability, Vehicle Liability and Property Damage Insurance:** As required under paragraph 28 of the General Conditions, the Contractor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than \$ _____ for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than \$ _____ on account of one accident, and Contractor's Property Damage Insurance in an amount not less than \$ _____.

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

5. **Photographs of Project:** As provided in paragraph 30 of the General Conditions, the Contractor will furnish photographs in the number, type and stage as enumerated below:
6. **Schedule of Occupational Classifications and Minimum Hourly Wage Rates as Required under Paragraph 52 of the General Conditions:** Given on pages _____, _____ and _____.
7. **Builder's Risk Insurance:** As provided in the General Conditions, paragraph 29 (e), the Contractor will/will not* maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portions of the project for the benefit of the Owner, the Contractor and all Subcontractors, as their interests may appear.

*Strike out one.

8. **Special Equal Opportunity Provisions:**

- A. 3-Paragraph Equal Opportunity Clause for Activities and Contracts Not Subject to Executive Order 11246, as Amended (applicable to Federally assisted construction contracts and related subcontracts \$10,000 and under). During the performance of this Contract, the Contractor agrees as follows:
1. The Contractor shall not discriminate against any employer or applicant for employment because of race, color, religion, sex or national origin. The Contractor shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
 2. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by contracting officer setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
 3. Contractors shall incorporate foregoing requirements in all subcontracts.

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

1. Section 202 Equal Opportunity Clause: During the performance of this Contract, the Contractor agrees as follows:
 - a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applications for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
 - b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration without regard to race, color, religion, sex or national origin.
 - c. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the Contract Compliance Officer advising the said labor union or workers' representatives of the Contractor's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - d. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor.
 - e. The Contractor will furnish all information and reports required by executive Order 11246 of September 24, 1965, and by rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to their books, records and accounts by the Department and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and others.
 - f. In the event of the Contractor's non-compliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations or orders, this Contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.
 - g. The Contractor will include the provisions of the sentence immediately preceding paragraph a. and the provisions of paragraphs a. through g. in every subcontract or purchase order unless exempted by rules, regulations or order of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions, including sanctions for non-compliance. Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Department, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.
2. Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) (applicable to contract/subcontracts exceeding \$10,000):

- a. The Offerer's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
- b. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

<u>Goals for Minority Participation</u>	<u>Goals for Female Participation</u>
(Insert Goals)	(Insert Goals for Current Year)

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

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

- c. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within ten (10) working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the Subcontractor; employer identification number; estimated dollar amount of the subcontract; and the geographical area in which the contract is to be performed.

- d. As used in this notice, and in the contract resulting from the solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county, and city, if any).

3. Standard CDBG Assisted Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246):

- a. As used in these specifications:
 1. "Covered area" means the geographical area described in the solicitation from which this Contract resulted.
 2. "Director" means Director, Office of Federal Contract Compliance Program, United States Department of Labor, or any person to whom the Director delegates authority.

3. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
4. "Minority" includes:
 - a. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin).
 - b. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race).
 - c. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific Islands).
 - d. American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
5. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this Contract resulted.
6. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the plan area (including goals and timetables) shall be in accordance with that plan for those trades which have unions participating in the plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the plan goals and timetables.
7. The Contractor shall implement the specific affirmative action standards provided in paragraphs 10(a) through 10(p) of these specifications. The goals set forth in the solicitation from which this Contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction Contractors performing contracts in geographical areas where they do not have a Federal or Federally—assisted construction contract shall apply the minority and female goals established for the geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
8. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these

specifications, Executive Order 11246, nor the regulations promulgated pursuant thereto.

9. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
10. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 10(b) above.

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

- n. Ensure that all facilities and company activities are non-segregated except that separate or single-use toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and supplies, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
11. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (10(a) through (p)). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 10(a) through (p) of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation shall not be a defense for the Contractor's non-compliance.
 12. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
 13. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex or national origin.
 14. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
 15. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
 16. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 10 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

17. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
18. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application or requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

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

*Parking lots, drinking foundations, recreation or entertainment areas.

- D. Title VI Clause, Civil Rights Act of 1964: Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.
- E. Section 109 Clause, Housing and Community Development Act of 1974: No person in the United States shall on the grounds of race, color, national origin or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.
- F. "Section 3" Compliance in the Provision of Training, Employment and Business Opportunities:
1. The work to be performed under this Contract is a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject

to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12, U.S.C. 1701u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given lower income residents of the project area and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by, persons residing in the area of the project.

2. The parties to this Contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this Contract. The parties to this Contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.
3. The Contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract or understanding, if any, a notice advising the said labor organization or workers' representative of this commitment under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.
4. The Contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal financial assistance, take appropriate action pursuant to the subcontract upon a finding that the Subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The Contractor will not subcontract with any Subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 135 and will not let any subcontract unless the Subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.
5. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Department issued hereunder prior to the execution of the Contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient for such assistance, its successors and assigns. Failure to fulfill these requirements shall subject the applicant or recipient, its contractors and subcontractors, its successors and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provided, and to such sanctions as are specified in 24 CFR Part 135.

G. Rehabilitation Act of 1973, Section 504 Handicapped (if \$2,500 or over): Affirmative Action for Handicapped Workers:

1. The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. The Contractor agrees to comply with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
3. In the event of the Contractor's non-compliance with the requirements of this clause, actions for non-compliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
4. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notices shall state the Contractor's obligation under the law to take

affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

5. The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 504 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.
6. The Contractor will include the provisions of this clause in every subcontract or purchase order of \$2,500 or more unless exempted by rules, regulations or orders of the Secretary issued pursuant to Section 504 of the Act, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for non-compliance.

H. Section 402 Veterans of the Vietnam Era (if \$10,000 or over): Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era:

1. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based on their disability or veteran status in all employment practices such as the following: employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. The Contractor agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this Contract and those which occur during the performance of this Contract, including those not generated by this Contract and including those occurring at an establishment of the Contractor other than the one wherein the Contract is being performed but excluding those of independently operated corporate affiliates, shall be listed at an appropriate local office of the State employment service system wherein the opening occurs. The Contractor further agrees to provide such reports to such local office regarding employment openings and hires as may be required.
State and local government agencies holding Federal contracts of \$10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service, but are not required to provide those reports set forth in paragraphs 4 and 5.
3. Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and non-veterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the Contractor from any requirements in Executive Orders or regulations regarding nondiscrimination in employment.
4. The reports required by paragraph 2 of this clause shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local office or, where the Contractor has more than one hiring location in a State, with the central office of that State employment service. Such reports shall indicate for each hiring location (1) the number of individuals hired during the reporting period, (2) the number of nondisabled veterans of the Vietnam era hired, (3) the number of disabled veterans of the Vietnam era hired, and (4) the total number of disabled veterans hired. The reports should include covered veterans hired for on-the-job training under 38 U.S.C.1787. The Contractor shall submit a report within 30 days after the end of each reporting period wherein any performance is made on this Contract identifying data for each hiring location copies of the reports submitted until the expiration of one year after final payment

- under the Contract, during which time these reports and related documentation shall be made available, upon request, for examination by any authorized representatives of the contracting officer or of the Secretary of Labor. Documentation would include personnel records respecting job openings, recruitment and placement.
5. Whenever the Contractor becomes contractually bound to the listing provisions of this clause, it shall advise the employment service system in each State where it has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these provisions and has so advised the State system, there is no need to advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by the contract clause.
 6. This clause does not apply to the listing of employment openings which occur and are filled outside of the 50 states, the District of Columbia, Puerto Rico, Guam and the Virgin Islands.
 7. The provisions of paragraphs 2, 3, 4 and 5 of this clause do not apply to openings which the Contractor proposes to fill from within its own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of its own organization or employer-union arrangement for that opening.
 8. As used in this clause:
 - a. "All suitable employment openings" includes, but is not limited to, openings which occur in the following job categories: production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings that are compensated on a salary basis of less than \$25,000 per year. This term includes full-time employment, temporary employment of more than three days' duration, and part-time employment. It does not include openings which the Contractor proposes to fill from within its own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement nor openings in an educational institution which are restricted to students of that institution. Under the most compelling circumstances an employment opening may not be suitable for listing, including such situations where the needs of the Government cannot reasonably be otherwise supplied, where listing would be contrary to national security, or where the requirement of listing would otherwise not be for the best interest of the Government.
 - b. "Appropriate office of the State employment service system" means the local office of the Federal-State national system of public employment offices with assigned responsibility for serving the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico and the Virgin Islands.
 - c. "Openings which the Contractor proposes to fill from within its own organization" means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies) and includes any openings which the Contractor proposed to fill from regularly established "recall" lists.
 - d. "Openings which the Contractor proposes to fill pursuant to customary and traditional employer-union hiring arrangements" means employment openings which the Contractor proposes to fill from union halls, which is part of the customary and traditional hiring relationship which exists between the Contractor and representatives of its employees.
 9. The Contractor agrees to comply with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
 10. In the event of the Contractor's non-compliance with the requirements of this clause, actions for non-compliance may be taken in accordance with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
 11. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notice shall state the Contractor's obligation under the law to take

affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era for employment, and the rights of applicants and employees.

12. The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Vietnam Era Veterans Readjustment Assistance Act, and is committed to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era.
13. The Contractor will include the provisions of this clause in every subcontract or purchase order of \$10,000 or more unless exempted by rules, regulations or orders of the Secretary issued pursuant to the Act, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontractor or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for non-compliance.

- I. Age Discrimination Act of 1975: During the performance of this Contract, the Contractor agrees as follows: the Contractor agrees not to exclude from participation, deny program benefits, or discriminate on the basis of age.

9. Certification of Compliance with Air and Water Acts (applicable to Federally assisted construction contracts and related subcontracts exceeding \$100,000):

Compliance with Air and Water Acts

During the performance of this Contract, the Contractor and all Subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended. In addition to the foregoing requirements, all nonexempt Contractors and Subcontractors shall furnish to the Owner, the following:

- A. A stipulation by the Contractor or Subcontractors that any facility to be utilized in the performance of any nonexempt contract or subcontract is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.
- B. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
- C. A stipulation that as a condition for the Contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, or EPA indicating that a facility utilized, or to be utilized for the Contract, is under consideration to be listed on the EPA List of Violating Facilities.
- D. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraphs A through D of this section in every nonexempt subcontract and requiring that the Contractor will take such actions as the Government may direct as a means of enforcing such provisions.

10. Special Conditions Pertaining to Hazards, Safety Standards and Accident Prevention:

- A. Lead—Based Paint Hazards (applicable to contracts for construction or rehabilitation of residential structures)
The construction or rehabilitation of residential structures is subject to the HUD Lead-Based Paint regulations, 24 CFR Part 35. The Contractor and Subcontractors shall comply with the provisions for the elimination of lead-based paint hazards under subpart B of said regulations. The Owner will be responsible for the inspections and certifications required under Section 35.14(f) thereof.
- B. Use of Explosives (modify as required)

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

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

C. Danger Signals and Safety Devices (modify as required)

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

11. Wage Rate Determination(s): (appropriate wage rates shall be inserted here)

AS-BUILT CERTIFICATION FORM

I CERTIFY that construction of _____'s Project Number _____
(Sub-Recipient) (Project Number)

has been completed in accordance with the original and revised plans and specifications and are consistent with the scope of the approved project and that a copy of the As-Built drawings have been delivered to the OWNER.

(Project Engineer's/Architect's Signature)

(Date)

The undersigned certifies that the OWNER has received a copy of the As-Built drawings for the above-mentioned project.

(Mayor's/Chairman's Signature)

(Date)

CITY OF TROY'S STANDARD CONTRACT PROVISIONS

INDEPENDENT CONTRACTOR

It is the intention of the parties hereto that this Agreement shall create an independent contractor relationship between them. The ARCHITECT is and shall be solely an independent contractor at all times. The ARCHITECT is not and shall not be an employee, agent, servant, partner, or joint venture with or of the City, and nothing in this Agreement shall at any time be construed as creating any type of employer-employee, principal-agent, master-servant, partnership or joint venturer relationship between the City and the ARCHITECT. The ARCHITECT shall have no right or authority, and cannot and shall not attempt to enter into any contract, commitment or agreement, or make any representation, or incur any debt or liability of any nature in the name of or on behalf of the City without the specific written authorization of the City nor shall the ARCHITECT ever represent that it has any authority to do so. Neither party shall represent to others that the relationship between them is other than as stated above.

QUALIFIED PERSONNEL

The obligations and duties to be performed by the ARCHITECT under this Agreement shall be performed by persons qualified to perform such duties efficiently. The ARCHITECT, if the OWNER shall so direct, shall replace any ARCHITECT or other person employed by the ARCHITECT in connection with the work.

DEFAULT

The ARCHITECT's employment under this Agreement may be cancelled or terminated by the OWNER in whole or in part by written notice of default to the ARCHITECT upon non-performance, violation of contract terms, delivery failure, bankruptcy or insolvency, or the making of an assignment for the benefit of creditors. The OWNER reserves the right to grant the ARCHITECT a specified cure period during which to cure or remedy the default, which cure period shall be included in the written notice of default. If default is not cured within the specified time, OWNER reserves the right, but is not obligated to, extend the cure period or OWNER may deem the ARCHITECT's employment under the Agreement terminated without further notice. In any event, the defaulting the ARCHITECT (and its surety, if any) shall be liable to the OWNER for any and all costs, damages and fees (including attorney's fees) incurred by the OWNER as a result of the default. Lack of knowledge by the ARCHITECT will in no way be a cause for relief from responsibility.

INDEMNIFICATION

Provided that the duty to defend agreed to herein is specifically limited to claims that are otherwise covered by the ARCHITECT's policy of professional liability insurance, the ARCHITECT shall indemnify, defend, and hold harmless the Owner and Owner's officers, employees, council

members, agents, and representatives from and against all claims, actions, suits, damage judgments, liabilities, causes of action, assessments, liens, fines, losses, injuries (including death), property damage, costs and/or expenses (including without limitation attorney's fees and all other costs and expenses), consultant fees, amounts paid in settlement or otherwise suffered or incurred by the Owner, its officers, employees, council members, agents, or representatives arising from or resulting from any claim and/or action relating to the Project to the extent caused by an act of negligence, recklessness, intentional tort, intellectual property infringement, or failure to pay a subconsultant or supplier by the ARCHITECT or the ARCHITECT's agent, consultant under contract, or other entity for which the ARCHITECT is legally liable, including the ARCHITECT's officers, directors, members, partners, agents, employees, or Consultants.

INSURANCE

- 1 The ARCHITECT does hereby agree to name the City of Troy as "Additional Insured, Primary and Non-Contributory", in its Commercial Auto Liability Insurance and Commercial General Liability Insurance; and to keep in effect at all times during the term of this Agreement the following minimum limits of insurance, and to provide the City of Troy with Certificates of Insurance with a 30 day Notice of Cancellation evidencing such insurance:

Commercial Automobile Liability Insurance including Hired and Non-Owned Auto Liability: \$1,000,000 Combined Single Limit of Liability;

Commercial General Liability Insurance: \$1,000,000 Combined Single Limit Per Occurrence/\$2,000,000 Aggregate Limit of Liability; \$1,000,000 Personal and Advertising Injury; \$2,000,000 Products and Completed Operations Liability;

Workers Compensation and Employers Liability Insurance: Insurance must meet the insurance requirements as set forth in the current Workers Compensation Act of the State of Alabama. Minimum Employers Liability Limits: \$1,000,000 Each Accident; \$1,000,000 Disease Each Employee; \$1,000,000 Disease policy Limit.

- 2 The ARCHITECT does hereby agree to provide the City of Troy with Certificates of Insurance with a 30 Day Notice of Cancellation evidencing Professional Errors and Omissions Insurance with Limits of Insurance no less than \$2,000,000 Per Claim/ Annual Aggregate, or the Total Cost of the PROJECT, whichever is greater.

LICENSE AND LAW COMPLIANCE

- 1 The ARCHITECT and all persons and entities acting on behalf of the ARCHITECT shall comply with all applicable federal, state, and local laws, regulations, rules, ordinances, requirements, and applicable orders of any public authority. If the ARCHITECT or any person or entity acting on behalf of the ARCHITECT fails to so comply, the ARCHITECT shall have full and sole responsibility therefor, shall bear all costs and legal consequences

attributable thereto, and shall indemnify, hold harmless, and defend the OWNER with respect to any such failure to comply.

- 2 The ARCHITECT agrees that its professional services shall be performed with that degree of care and skill ordinarily exercised under similar circumstances by reputable licensed professionals.

NO ASSIGNMENT

No part of this Agreement, nor any right, obligation, or privilege created or provided hereunder, shall be assigned or transferred unless the OWNER shall first approve the same in writing, nor shall the ARCHITECT attempt to sell or attempt to transfer this Agreement or any rights hereunder to another without written approval of the OWNER.

EQUAL EMPLOYMENT OPPORTUNITY

In connection with the execution of this Agreement, the ARCHITECT and its sub-consultants shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, or national origin. The ARCHITECT shall take affirmative action to ensure that minority and disadvantaged applicants are employed, and employees are treated during their employment without regard to race, religion, color, sex, age or national origin.

VIOLATION OF IMMIGRATION LAW PROHIBITED

By signing this Agreement, the ARCHITECT does hereby affirm, for the duration of the Agreement, that it will not violate federal or state immigration law or knowingly employ, hire for employment or continue to employ an unauthorized alien within the State of Alabama. ARCHITECT shall defend, indemnify and hold OWNER harmless from any fines, costs, losses, damages, claims, actions or suits (including attorney's fees) incurred as a result of any violation of this provision.

TAXES

ARCHITECT will pay all social security and other taxes imposed upon it as an employer in connection with the performance of this Agreement and will furnish evidence when required by OWNER showing that all such required payments have been paid. ARCHITECT shall pay all local, state and federal taxes, as well as any sales tax, connected with the performance of its services under this Agreement.

TABLE OF CONTENTS-SPECIFICATIONS

A New Community Center

at

Knox Street Park

for the

City of Troy

Troy, Alabama

LATHAN MCKEE PROJECT NO. MKA 24-261

BIDDING REQUIREMENTS

- City of Troy's Standard Contract Provisions
- Request for Information (Lathan McKee Form)
- Prior Approval/Substitution Request Form (Lathan McKee Form)
- Certification of Asbestos Free Building Materials (Lathan McKee Form)

TECHNICAL SPECIFICATIONS

DIVISION 01 GENERAL REQUIREMENTS

01010	Scope of Work
01011	Contingency Allowances
01250	Contract Modification Procedures
01290	Payment Procedures
01320	Construction Progress Documentation
01322	Photographic Documentation
01330	Submittal Procedures
01500	Temporary Facilities and Controls
01600	Product Requirements
01700	Execution Requirements
01770	Closeout Procedures
01781	Project Record Documents
01782	Operation and Maintenance Data
01820	Demonstration and Training

DIVISION 02 SITE WORK

02100	Site Preparation
02200	Earthwork
02201	Soils Report
02282	Termite Control

02660	Water Distribution System
02720	Storm Sewers
02730	Sanitary Sewers
02810	Sodding and Topsoil
02830	Temporary Chain Link Fencing & Gates
02825	Aluminum Ornamental Fence System
02846	Site Graphics

DIVISION 03 CONCRETE

03310	Cast-In-Place Concrete
03410	Structural Precast Concrete
03950	Concrete Sealer

DIVISION 04 MASONRY

04200	Unit Masonry
04720	Architectural Cast Stone

DIVISION 05 METAL

05540	Metal Studs
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DIVISION 06 CARPENTRY

06100	Rough Carpentry
06192	Metal Plate Connected Wood Trusses
06200	Finish Carpentry
06241	Solid Surface Fabrications
06446	Architectural Composite Columns

DIVISION 07 MOISTURE PROTECTION

07200	Insulation
07310	Dimensional Fiberglass Asphalt Shingles (Architectural)
07600	Flashing and Sheet Metal
07900	Joint Sealers

DIVISION 08 DOORS, WINDOWS AND GLASS

08100	Steel Doors Frames
08211	Wood Doors
08410	Aluminum Storefronts
08700	Finish Hardware
08800	Glazing

DIVISION 09 FINISHES

09250	Gypsum Drywall
09301	Porcelain Tile
09510	Acoustical Ceilings
09650	Rubber Base
09651	Luxury Vinyl Tile Flooring (LVT)
09900	Painting

DIVISION 10 SPECIALTIES

10160	Toilet Partitions
10410	Identifying Devices
10440	Fire Extinguishers and Accessories
10800	Toilet Accessories

DIVISION 11 EQUIPMENT

11450	Residential Appliances
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DIVISION 12 FURNISHINGS

12304	Laminate Clad Casework
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DIVISION 13-14

Not Applicable

DIVISION 15 MECHANICAL

15050	General HVAC Requirements
15052	Common Work Results for Plumbing
15057	Common Motor Requirements for Plumbing Equipment
15061	Hangers and Supports for Plumbing Piping and Equipment
15076	Identification for Plumbing Piping and Equipment
15077	Identification for HVAC Piping and Equipment
15082	Plumbing Piping Insulation
15086	Duct Insulation
15088	HVAC Piping Insulation
15111	General-Duty Valves for Plumbing Piping
15126	Meters and Gages for Plumbing Piping
15140	Domestic Water Piping
15145	Domestic Water Piping Specialties

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

TABLE OF CONTENTS
Page 3 of 4

15150	Sanitary Waste and Vent Piping
15155	Sanitary Waste Piping Specialties
15183	Refrigerant Piping
15410	Plumbing Fixtures
15485	Electric Water Heaters
15671	Outdoor Condensing Units and Heat Pumps
15725	Indoor Heat Pump Unit
15739	Ductless Split-System Air Conditioning Units
15815	Metal Ducts
15820	Duct Accessories
15838	Power Ventilators
15855	Diffusers, Registers, and Grilles
15900	HVAC Instrumentation and Controls
15940	Sequence of Operation
15950	Testing, Adjusting, and Balancing

DIVISION 16 ELECTRICAL

16100	Electrical
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END OF TABLE OF CONTENTS

REQUEST FOR INFORMATION

(RFI)

Email this form in its entirety to Project Manager listed below.

The Architect reserves the right not to answer any Request For Information received after 2:00 p.m., Two (2) days prior to the bid date.

To: Lathan Mckee, Architects

Warwick Woodham, Project Manager

wwoodham@lathanmckee.com

Email

From: _____

Name

Company

Email

Project: _____

Project Number: _____

Request For Information Number: _____

Issue Date: _____

☐ BID PHASE

☐ CONSTRUCTION PHASE

Procedures for "Explanations and Interpretations":

- a. Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.
- b. Clarification will be made only by written Addenda sent to all prospective bidders or can be accessed by going to the McKee web site - mckeeassoc.com and clicking on the tab "Files" to retrieve the Addendums. Neither the Architect nor the Owner will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.
- c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

REQUEST FOR INFORMATION DESCRIPTION: (Fully describe the question or type of information requested.)

REFERENCES/ATTACHEMENTS: (List specific documents researched when seeking the information requested.)

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Drawing Sheet Number: _____ Title: _____

Plan: _____ Elevation: _____ Section: _____ Detail: _____

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

REQUEST FOR INFORMATION (RFI)
0000- 1

LATHAN MCKEE PROJECT NO. MKA 24-261

Other:

RECEIVERS REPLY:

Signed by: _____ Date: _____ Copies to: _____

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

REQUEST FOR INFORMATION (RFI)
0000- 2

LATHAN MCKEE PROJECT NO. MKA 24-261

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

REQUEST FOR INFORMATION (RFI)
0000- 3

LATHAN MCKEE PROJECT NO. MKA 24-261

REQUEST FOR APPROVAL (RFA)

PRIOR APPROVAL/SUBSTITUTION REQUEST

Email this form in its entirety to Project Manager listed below.

All products, materials, systems, equipment and services requested for prior approval must be submitted to the architect for approval **no later than 2:00 p.m., Ten (10) days prior to the bid date.**

To: Lathan Mckee, Architects Substitution Request Number: _____
Warwick Woodham From: _____
wwoodham@lathanmckee.com Date: _____
Email

Project: _____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Procedures for “Substitutions” and “Pre-Bid Approval”:

- a. The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer’s name, model number, etc. (hereinafter referred to as “source”), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph “D” below apply.
- b. When the Bid Documents identify only one or two sources, or three or more sources followed by “or approved equal” or similar wording, the bidder’s proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without “Pre-bid Approval” as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.
- c. When the Bid Documents identify three or more sources and the list of sources is not followed by “or approved equal” or similar wording, the bidder’s proposal shall be based upon one of the identified sources, unless the bidder obtains “Pre-bid Approval” of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not identified in the Bid Documents or granted “Pre-Bid Approval” will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.
- d. If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder’s proposal must be based upon the identified sole source.
- e. **Procedures for “Pre-Bid Approval”.** If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect **at least ten days prior to the date set for the opening of bids.** At the Architect’s discretion, this ten day provision may be waived. **The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application.** The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. **The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents.**

The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

The undersigned requests consideration of the following product substitution:

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Supporting Data Attached: ☐ Product Description ☐ Drawings ☐ Photographs ☐ Performance & Test Data ☐ Specifications

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned states and certifies the following: (Mark Boxes as Applicable)

☐ Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

or

☐ Proposed substitution differs from what is specified in the Bid Documents. Submitted Data clearly identifies all differences from what is specified in the Bid Documents.

☐ No changes will be required to the Contract Documents for the proper installation of the proposed product substitution.

or

☐ Changes will be required to the Contract Documents for the proper installation of the proposed product substitution. Submitted Data clearly identifies description of changes.

and

☐ Warranty will be furnished for proposed substitution ☐ Equal to or ☐ Superior to specified product.

☐ Proposed substitution does not affect dimensions shown on the drawings and functional clearances.

☐ No changes will be required to the building design, engineering design or detailing by the proposed substitution.

☐ Proposed substitution will have no adverse effect on other trades and will not affect or delay construction progress schedule.

☐ No maintenance is required by the proposed substitution other than that required for originally specified product.

☐ Other Information:

The undersigned further states that they have read the corresponding specification sections in the project manual and confirms that the function, appearance and quality of the proposed substitution are equivalent to or superior to the originally specified product.

Submitted by: (Print)

Signature:

Date:

Firm:

Address:

Email:

Telephone:

A/E REVIEW AND ACTION

☐ Substitution Approved

☐ Substitution Approved as noted

☐ Substitution Rejected

☐ Substitution Request Received to Late

Comments:

Signed by:

Date:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

PRIOR APPROVAL / SUBSTITUTION REQUEST FORM
0000-2

LATHAN MCKEE PROJECT NO. MKA 24-261

CERTIFICATE OF ASBESTOS FREE BUILDING MATERIALS

The undersigned hereby states that all building materials incorporated, installed, and used during the construction process for the below listed project by the Contractor or its Subcontractors of any tier are 100% asbestos free. **Asbestos Free means containing 0% asbestos in any form.** Refer to Section 01600, Product Requirements.

McKee Project Name: _____

McKee Project Number: _____

CERTIFICATION: The undersigned certifies that he or she is authorized to execute contracts and legal documents on behalf of the General Contractor as legally named, that this certification is submitted in good faith without fraud or collusion with any other person, that the information indicated in this document is true and complete, and that the document is made in full legal agreement.

To: _____
(Owner / Awarding Authority of Construction Contract)

Date _____

Legal Name of General Contractor _____

General Contractor State License No. _____
(Exactly as appears on license including designation letters)

General Contractor Mailing Address _____

By (Legal Signature) _____

Name & Title (print) _____

Telephone Number _____

E-Mail Address _____

SECTION 01010 - SCOPE OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 specification sections apply to the work of this section.

1.2 PROJECT / WORK IDENTIFICATION

- A. General: Project name is as indicated in the Advertisement For Bids and as shown on the Contract Documents prepared by Lathan Mckee, Architects, 3500 Eastern Boulevard, Suite 300, Montgomery, Alabama 36116.
- B. Contract Documents: Indicate the work of the Contract and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the Contract Documents include, but are not limited to the following:
 - 1. Existing site conditions and restrictions on use of the site including ingress and egress to the site.
 - 2. Grading operations at the site.
 - 3. The Contractor shall be responsible to secure the site during the execution of the work and provide proof of insurance including but not limited to General Liability, W/C, Auto, Equipment, Etc.
- C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, the Project Manual, Technical Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to, printed material referenced by any of the above. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.

1.3 SUPERVISION

- A. Supervision: The Contractor shall provide adequate supervision of the project to ensure proper supervision for all work.

1.4 CONTRACTOR USE OF PREMISES

- A. General: During the entire cleanup period the Contractor shall have the exclusive use of the premises for cleanup operations, including full use of the site as shown on the Drawings.
- B. Limitations of exclusive use of the site:
 - 1. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project performance. See site plan for ingress and egress to the site, or if not indicated, same shall be as designated by the Architect.
 - 2. Keep existing public roads, driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.
 - 3. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds and or designated storage areas as indicated.
 - 4. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

5. The Owner, and their representatives, the Architect and their Consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and perhaps other purposes, related to the planned new construction. All Contractors shall assist in such accessibility, to at least the point of providing and maintaining accessible dry paths to work in progress.
6. Furnish and install by contractor temporary barricades, fencing, etc., as indicated or otherwise required, to restrict pedestrian and vehicular traffic from construction operations, including in part, Owner's staff, the public, students, children, and residents of the adjacent residential neighborhoods.
7. Construction operations shall not affect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others. Refer to Division 1 Section "Special Conditions" for additional information and requirements regarding coordination with Owner's activities, etc.
8. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.
9. All contractors and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
10. Parking on-site, if any, shall be limited to the "staging areas" indicated on the Drawings, or if not indicated, as mutually agreed between the Architect and Contractor at the Pre-Construction Conference.
11. Smoking or other use of tobacco products shall not be permitted within the structure of the Building, Owner's facilities or on roofs.
12. The use or presence of alcohol and/or other debilitating substances shall not be permitted in the construction of the building and or on the project site.
13. Firearms and/or other weapons shall not be permitted on the project site.
14. The Contractor shall furnish necessary temporary toilets for all work forces on the job site.

1.5 COMPLETION TIMES

15. All work shall be completed in no later than **180 calendar days** from notice to issuance from Owner.

PART 2 - SCOPE OF THE WORK

2.1 DEFINITIONS

- A. The Scope of the Work of the Contract is meant to be viewed as a successor to the General Special Conditions of the Contract. Should any discrepancy or ambiguity be noted, the Scope of the Work of the Contract shall apply and the General Special Conditions of the Contract shall defer to Scope of the Work of the Contract Documents. The scope of the work shall be taken in its entirety by all contractors. In signing the contract all contractors have read and understand that the Scope of the Work and the General Special Conditions are taken in their entirety.
 1. The term "Design Consultant" shall be construed to mean "Architect".
 2. The terms "Owner" shall mean "**City of Troy, Alabama**".

2.2 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at the Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Work done by others or by Owner.
 - a. Any items noted N.I.C.
 - b. Construction Testing as defined in Section 01400 Quality Requirements.

2.3 BUILDING AND SITE CONSTRUCTION

- A. The Contractor shall maintain the entire site, provide dust control and keep the streets clean at all times and or as directed by the Architect. The Contractor shall call for and be responsible for the locating of all utilities prior to start of work. Use extreme care when working in close proximity to the existing water lines to prevent movement and damage to the water lines.
- B. The Contractor shall install and or replace all fencing including furnish and install all temporary fencing as required for all work including safety barriers, signs, traffic directional signals, temporary stripping, flagman, temporary road plates and any temporary roads around any obstruction and or work being constructed. The Contractor shall make all provisions to keep the public and or temporary access roads open during the duration of the work.
- C. The Contractor shall maintain & level, all temporary roads and temporary lay down and storage areas using same stone base material. Roads must have no potholes, dips, or rises and provide access to and from the site and other locations on site. The Contractor shall maintain the temporary roads used to move material on the site. Temporary roads are existing and the Contractor shall maintain these temporary roads throughout the duration of construction activity while Contractor is onsite.

2.4 GENERAL ISSUES

- A. The Contractor shall be responsible for their own on-site safety requirements within the site per OSHA regulations.
- B. Only an approved company owned and insured vehicle shall be allowed on to the construction site. Vehicles shall be clearly marked and identified with the company logo and or name.

2.5 TEMPORARY ELECTRICAL POWER AND JOBSITE UTILITIES

- A. The Contractor is responsible for the all costs associated with temporary electrical requirements for performance of the work. The Contractor shall be responsible for the all costs associated with temporary water required for the performance of the work. The Contractor is responsible for all other utility costs as required for the performance of the work.

2.6 SITE SECURITY / INSURANCE REQUIREMENTS

- A. The Contractor shall have care custody and control of the site. Contractor shall be responsible for the replacement of their material, equipment and any loss of such. Contractor shall be responsible for securing all material and equipment. If there is a loss and or damage of material and equipment, that loss shall go against the Contractor's insurance coverage.

2.7 PROTECTION OF WORK IN PLACE

- A. The Contractor shall protect all completed work and any rework shall be the responsibility of the contractor **at** no additional cost to the owner.

2.8 WORK RESTRICTIONS

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two days in advance of the proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- B. Nonsmoking Building: Smoking and smokeless tobacco will not be permitted within the new construction after floor slabs are poured.

2.9 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy: Owner will occupy adjacent parking lots during entire construction period.
Cooperate with Owner during construction operations adjacent to or near the existing building and parking to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
- B. Maintain access to existing walkways and other adjacent occupied or used facilities. Do not close or obstruct walkways or other occupied or used facilities without written permission from Owner and authorities having jurisdiction. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to place and install equipment in completed areas of building, before Substantial Completion, provided such does not interfere with completion of the Work. Such placement of equipment shall not constitute acceptance of the total Work.

2.10 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format numbering system.
 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications another Contract documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 3 - NOT APPLICABLE

END OF SECTION

SECTION 01011 - CONTINGENCY ALLOWANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 specification sections apply to the work of this section.

PART 2 - CONTINGENCY ALLOWANCES

2.1 BASE BID PROPOSAL

- A. The General Contractor shall include the following sums:
 - 1. **Twenty-Five Thousand Dollars (\$25,000.00)** as a contingency to cover unforeseen conditions or minor changes that are necessary to correct or supplement the work as detailed in the Contract Documents.

2.2 COSTS INCLUDED IN CONTINGENCY ALLOWANCES

- A. The Contractor shall include in the bid proposal(s) all overhead and profit on these Contingency Allowances, because no such costs will be paid to the Contractor for work performed under these Contingency Allowances. Overhead, as defined in shall cover the Contractor's indirect costs, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.
- B. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowance; such cost includes costs of materials and delivery, installation labor, payroll taxes and insurance, equipment expense, and the cost of subcontracted work (subcontractor's cost may include a maximum of [15%] mark-up for overhead and profit).
- C. The following requirements apply to the Contingency Allowance in lieu of the allowance cost provisions of [Section 3.8, Allowances, of AIA Document A201, General Conditions of the Contract for Construction]: the direct costs listed in Paragraph B, including installation labor and subcontracted work, shall be charged against the Contingency Allowance, and the Contractor's overhead and profit shall be included in the Contract Sum as stated in Paragraph A. When requested by the Architect or Owner, the Contractor shall obtain competitive pricing from responsible Subcontractors or suppliers for work to be charged against the Contingency Allowance.

PART 3 – AUTHORIZATION OF CONTINGENCY ALLOWANCES

3.1 AUTHORIZATION PROCEDURE

- A. After unknown conditions are identified and examined and the scope of work and method of repair determined, or request for a proposal to cover additional work has been issued by the Owner, the Contractor shall submit a proposal for such work to the Architect for the Owner's approval. If the Owner approves of such proposal, he will issue written authorization to the Contractor to perform the work and charge the related costs to the Contingency Allowance.
- B. At the Owner's option, work performed under this provision may be ordered done on a time and material basis, in which case, the Contractor shall keep accurate records of all time and materials used and submit such records to the Architect for his approval at the end of each day's work.
- C. Notwithstanding the purposes stated in Part 2, the Owner may, at the Owner's discretion, use any portion of the Contingency Allowance for other items of work within the Project. Such use shall be authorized in accordance with this Article and documented [on a Contingency Allowance Authorization Form] [by Contract Change Order].

3.2 ACCOUNTING

- A. An accounting of the costs charged against this Contingency Allowance shall be mutually maintained by the Contractor, Architect, and Owner throughout the course of the project. Any of

this Contingency Allowance not spent shall be credited to the Owner by Change Order at close out of the project.

3.3 PAYMENT

- A. The Contractor shall include a line item in the *Schedule of Values* entitled "Contingency Allowance". The estimated value of work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor's monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the **net total** of fully executed Contingency Allowance Authorizations.

CONTINGENCY ALLOWANCE AUTHORIZATION FORM

Form to be filled in its entirety.

To: Lathan McKee, Architects

From: _____

Project: _____

Company

Address

Contact and Email

Project Number _____

Date: _____

[Owner Project #]: _____

Authorization Number: _____

In accordance with Specification Section 01011 – CONTINGENCY ALLOWANCE, the Contractor [] is hereby authorized to proceed with the changes in Work as are described below and is to be paid for the performance of these changes as provided in Specification Section 01011. This Authorization shall become effective when it is signed by the Contractor and the Owner's representative and it is understood and agreed that the amount(s) stipulated below constitute full compensation for these changes in Work.

TOTAL AMOUNT OF THIS AUTHORIZATION \$

ORIGINAL AMOUNT OF THE CONTINGENCY ALLOWANCE \$

NET TOTAL OF PREVIOUS AUTHORIZATIONS \$

PREVIOUS REMAINING CONTINGENCY ALLOWANCE \$

TOTAL AMOUNT OF THIS AUTHORIZATION \$

CONTINGENCY ALLOWANCE REMAINING
AFTER THIS CONTINGENCY \$

Recommended By:

Authorized By:

Accepted By:

Architect

Owner

Contractor

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

CONTINGENCY ALLOWANCE
01011-3

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Section 01600 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, that may or may not involve an adjustment to the Contract Sum or the Contract Time, as an Architect's Supplemental Instructions, "ASI".

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time in the form of an ASI. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. ASIs issued by Architect, if adjustments to contract sum or contract time are involved, are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in ASI after receipt of ASI, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Include data as needed to validate material costs
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Change Order, Architect will issue a Change Order for signatures as required.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive, "CCD": Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Construction Change Directive contains a complete description of change in the Work.

PART 2 – NOT APPLICABLE

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. **At the discretion of the Architect, the contractor shall provide separate Schedule of Values for work on projects involving multiple locations, campuses, sites, buildings etc. and/or multiple scopes of work. Additional line items may be required within each separate Schedule of Values (i.e. separate line items for multiple buildings located on same site).**
- B. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of ABC Form C-11.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.

- f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate listing on Application and Certificate for Payment (Standard ABC Form C-10) for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or evidence of bonded warehousing.
 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. Unit Costs: Provide a separate line item in the Schedule of Values for each unit cost. Line-item to show value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payments shall be submitted to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the 23rd of the month.
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders issued before last day of construction period covered by application only after all agency approvals.
- D. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
- F. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- G. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. Certificate of Substantial Completion (Standard ABC Form C-13, August 2001)
 5. Form of Advertisement for Completion (Standard ABC Form C-14, August 2001)
 6. Evidence that claims have been settled.
 7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 8. Final, liquidated damages settlement statement.

PART 2 – NOT APPLICABLE

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.
- B. Related Sections include the following:
 - 1. Division 1 Section 01290 "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section 01310 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 1 Section 01330 "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 1 Section 01322 "Photographic Documentation" for submitting construction photographs.
 - 5. Division 1 Section 01400 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 SUBMITTALS

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit two copies at weekly intervals.
- D. Material Location Reports: Submit two copies at monthly intervals.
- E. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- F. Special Reports: Submit two copies at time of unusual event.
- G. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Verify availability of qualified personnel needed to develop and update schedule.
2. Discuss any constraints.
3. Review time required for review of submittals and re-submittals.
4. Review requirements for tests and inspections by independent testing and inspecting agencies.
5. Review time required for completion and startup procedures.
6. Review and finalize list of construction activities to be included in schedule.
7. Review submittal requirements and procedures.
8. Review procedures for updating schedule.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section 01330 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 14 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions, if any, and show how the sequence of the Work is affected.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
1. Refer to Division 1 Section 01290 "Payment Procedures" for cost reporting and payment procedures.
 2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be broken down within principal contracts in amounts typically not greater than \$30,000, but in no case greater than 5 percent of the Contract Sum.
 3. Each activity cost shall reflect an accurate value subject to approval by Architect.
 4. Total cost assigned to activities shall equal the total Contract Sum.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the time effect, if any, of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost-and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, timescaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. Approximate count of personnel at Project site by trade.
 3. Equipment at Project site.
 4. Material deliveries.
 5. High and low temperatures and general weather conditions.
 6. Accidents.
 7. Meetings and significant decisions.
 8. Unusual events (refer to special reports).
 9. Stoppages, delays, shortages, and losses.
 10. Meter readings and similar recordings.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
 14. Construction Change Directives and Architect Supplemental Interpretations (Instructions) received and implemented.
 15. Services connected and disconnected.
 16. Equipment or system tests and startups.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request For Interpretation (RFI). Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor must employ skilled personnel with experience in scheduling and reporting techniques or must employ a scheduling consultant. Submit qualifications and examples of previous scheduling for evaluation (and approval) by the Architect.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three (3) work days before each regularly scheduled progress meeting or Contractor may update schedule at the monthly progress meeting.
 - 1. The revised schedule should be updated immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting, no later than three days after the progress meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION

SECTION 01322 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction digital video.
 - 2. Periodic construction photographs.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each digital photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Digital Construction Photographs: Submit one print of each digital photographic view within seven days of taking photographs.
 - 1. Format: Digital.
 - 2. Identification: The following information is required on each CD submitted:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Date photograph was taken if not date stamped by camera.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - f. Unique sequential identifier.
 - 3. Digital Images: Submit a complete set of digital image electronic files as a Project Record document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.
- C. Digital Video: Submit one copy of each digital video with protective sleeve or case within seven days of recording.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - e. Date digital video was recorded.
 - f. Weather conditions at time of recording.
 - 2. Transcript: To include an audio narrative with the following information as a minimum.
 - a. Name of Project.
 - b. Date digital video was recorded.
 - c. Weather conditions at time of recording.

- d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - EXECUTION

2.1 CONSTRUCTION PHOTOGRAPHS

- A. Film Images:
 1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Architect.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 1. Date and Time: Include date and time in filename for each image.
 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before starting construction, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 1. Flag construction limits before taking construction photographs.
 2. Take eight photographs to show existing conditions adjacent to property before starting the Work.
 3. Take eight photographs of existing buildings either on or adjoining property in order to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 12 color, digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

2.2 CONSTRUCTION DIGITAL VIDEO

- A. Narration: Describe scenes on digital video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 1. Confirm date and time at beginning and end of recording.
 2. Begin each digital video with name of Project, Contractor's name, and Project location.
- B. Preconstruction Digital Video: Before starting construction, provide digital video of the Project site and surrounding properties from different vantage points, as needed to properly record all preexisting site conditions and adjacent conditions of all roadways, drives, structures that will incur construction traffic.
 1. Flag construction limits before recording construction video.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
 4. Show protection efforts by Contractor.

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The General Contractor shall use website software “**Submittal Exchange**” to conduct all submittal reviews in electronic format. **Paper format submittals will NOT be accepted.** All recordkeeping, date stamping, access controls, shall be **paid for by the Contractor** with access given to the entire Project Team. The software shall be capable of the following:
 - B. Costs:
 - 1. The General Contractor shall include the full cost of Submittal Exchange project subscription in their proposal. **The Contractor shall cover the full cost of Submittal Exchange project subscription for the project. The Contractor contractually, shall be fully responsible for all costs required to maintain full functionality through the acceptance of ALL project closeout requirements and documents. NO OTHER SOFTWARE WILL BE CONSIDERED.**
 - 2. **Contact Submittal Exchange at subex-sales_ww@oracle.com or call 1-800-633-0738 to verify costs prior to bid.**
 - 3. At the Contractor’s option, training is available from **Submittal Exchange** regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024 ext. 2
 - 4. Internet Service and Equipment Requirements:
 - a. Email address and Internet access at the Contractor’s main office.
 - b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.
 - 5. The General Contractor is responsible for maintaining and keeping Submittal Exchange active throughout the entire project, including closeout documents.
 - C. Procedures:
 - 1. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using **Submittal Exchange**, a website service designed specifically for transmitting submittals between construction team members.
 - 2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - 3. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
 - 4. Submittal Preparation – the Contractor may use any or all of the following options:
 - a. Subcontractors and Suppliers provide electronic (PDF) submittals to the Contractor via the **Submittal Exchange** website.
 - b. Subcontractors and Suppliers provide paper submittals to the General Contractor who electronically scans and converts to PDF format.
 - c. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
 - 5. The Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

6. The Contractor shall transmit each submittal to Architect using the Submittal Exchange website, www.submittalexchange.com.
7. The Architect / Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
8. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
9. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 01770 – Closeout Procedures.

D. Related Sections include the following:

1. Division 1 Section 01290 "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 1 Section 01320 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
3. Division 1 Section 01322 "Photographic Documentation" for submitting construction photographs and construction videotapes.
4. Division 1 Section 01770 "Closeout Procedures" for submitting warranties.
5. Division 1 Section 01781 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Division 1 Section 01782 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Division 1 Section 01820 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
8. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will, under certain circumstances described hereinafter, be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 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 parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section 01320 "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow **14** business days for initial review of each digital submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow **10** business days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow **10** business days for initial review of each submittal.
 - a. Structural, mechanical, plumbing, electrical, civil, audio/visual, sound system, and kitchen equipment components are examples of the Work that require sequential review. Architect will advise if there are others.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings. Provide another area of this same size for the Architect to affix his stamp. Stamp includes the following four categories: Reviewed, Furnish as Noted, Rejected, Revise and Resubmit; the Architect will mark one or more of these categories and return submittal to Contractor.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - i. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.D.2.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 06100.D.2.R1 (R2, R3 etc. if necessary).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Encircle or otherwise specifically identify deviations and list the deviations from the Contract Documents on submittals and list the deviations on the transmittal form accompanying submittal.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use AIA Document G810 or equivalent with at least the following information.
 - a. Project name.
 - b. Date.

- c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "Reviewed" or "Furnished as Noted".
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Reviewed" or "Furnished as Noted".

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
- 1. Contractor must sign a detailed agreement with the Architect that outlines responsibilities, liabilities, etc. of each party and must pay to the Architect a fee of \$75.00 for each sheet of drawings that are put on a disk for the Contractor's use.

PART 2 - PRODUCTS

2.1 DIGITAL ACTION SUBMITTALS

- A. General: Prepare and submit Digital Action Submittals required by individual Specification Sections.
- B. All submittals shall be sent to the Architect no later than 45 calendar days from "Notice To Proceed".
- 1. Submittals shall be sent to Greg Anderson at the following email address:
andersong@mckeeassoc.com.
- C. Submittals regarding mechanical, plumbing, electrical and structural items shall be sent directly to the Engineer of record.
- 1. A digital copy of the transmittal shall be sent to the Architect at the following email address:
andersong@mckeeassoc.com.

- D. Product Data: Collect information into a single digital submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each the digital submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit digital copy of the Product Data, unless otherwise indicated. Mark up and retain returned digital copy as a Project Record Document.
- E. Digital Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings are otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.

- m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Digital Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
- 3. Number of Copies:
 - a. Submit each original digital drawing submittal (specifically prepared for the project). Do not include MSDS documentation in any submittal. Architect will retain marked-up copy for his records and will return 1 (one) digital marked-up copy to the Contractor.
 - b. Submit digital copy (bound in sets) of hardware submittals, fixture schedules, manufacturers' data and all other submittals that have been prepared in an 11 inch by 17 inch or smaller format. The Architect will return 1 (one) digital copy set to the Contractor.
 - i. Upon receipt of his digital marked up shop drawings/submittals, the Contractor shall make as many copies for distribution as he deems necessary, however he shall retain one copy to mark-up further to show any and all construction changes that modify the submittal in any form. This document(s) shall be turned over to the Owner at the end of the Project along with the Record Documents.
- F. Color code: On all digital shop drawings submittals, schedules, etc., the Contractor's marks shall be in red, the Architect's in green and the Engineer's (if any involved) in blue. All comments shall be initialed by a responsible party within each organization.
- G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available. **Colors will not be approved until all color submittals are received by the architect.**
 - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
 - b. All color submittals are due within 45 days of the Notice to Proceed.
 - c. The architect will be allowed 15 days from the date of the receipt of the last color submittal to approve colors.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of

color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set and one will be returned. Mark up returned Sample set as a Project Record Sample.
 - i. Construct a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - ii. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- H. Interior Color Selections: Any submittals that are associated with the aesthetics of the interior design shall not be approved until all submittals associated with the interior design are in the Architect's possession.
- I. Submittals Schedule: Comply with requirements specified in Division 1 Section 01320 "Construction Progress Documentation."
- J. Application for Payment: Comply with requirements specified in Division 1 Section 01290 "Payment Procedures."
- K. Schedule of Values: Comply with requirements specified in Division 1 Section 01290 "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit digital copy of each submittal, unless otherwise indicated.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section 01400 "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section, 01310 "Project Management and Coordination."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section 01782 "Operation and Maintenance Data."
- P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.

- R. **Manufacturer's Field Reports:** Prepare written information documenting factory authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. **Construction Photographs and Videotapes:** Comply with requirements specified in Division 1 Section 01322 "Photographic Documentation."
- U. **Material Safety Data Sheets (MSDSs):** Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for re-submittal.

2.3 DELEGATED DESIGN

- A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit one copy of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each digital submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. **Approval Stamp:** Stamp each digital submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. **General:** Architect will not review digital submittals that do not bear Contractor's approval stamp and will return them without action.

- B. Action Submittals: Architect will review each digital submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each digital submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. REVIEWED—Indicates that reviewed submittal is satisfactory.
 2. REJECTED—Indicates submittal is not satisfactory and another properly prepared submittal of same or another product must be prepared and resubmitted.
 3. FURNISH AS NOTED—Indicates submittal is satisfactory if the changes, modifications, notes, etc. marked by the Architect are made a part of the submittal.
 4. REVISE AND RESUBMIT—Indicates although parts of the submittal are satisfactory, there are enough significant modifications that must be made to require the Contractor, subcontractor, supplier, and/or manufacturer to provide additional essential information to his submittal and then resubmit it to the Architect.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 1 Section 01100 "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 1 Section 01330 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 1 Section 01700 "Execution Requirements" for progress cleaning requirements.
 - 4. Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
 - 5. Division 2 Section 02282 "Termite Control" for pest control.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Sewer connections will not be in place for most if not all of the duration of the project. When and if the off-site sewer is installed by others and sewer piping under this contract is installed, should the contractor decide to connect to the sewer he must pay all sewer use charges until the project is turned over to the Owner.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use

as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack board.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services. Sanitary Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 2. Connect temporary sanitary sewer from construction office to a submerged temporary holding tank, as directed by authorities having jurisdiction.

3. Provide erosion control structures to drain storm water from site.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction from existing water lines in the street. Contractor shall pay for any metering costs and associated fees required by the City Water Department.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide temporary electric meter power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Contractor shall be responsible for any charges associated with said service.
 1. Install electric power service overhead, unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- I. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities, or other suitable high speed internet connection.
 1. Provide DSL in primary field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:

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City of Troy
Troy, Alabama

TEMPORARY FACILITIES AND CONTROLS
01500-3

1. Provide incombustible construction for offices, shops, and sheds located within construction area with good visibility of construction. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- D. Project Identification and Temporary Signs: Erect Project identification, General Contractor's sign, Architect's sign and other signs as approved. Install signs where directed to inform public and individuals seeking entrance to Project. Subcontractor signs are not permitted.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
- F. Temporary Stairs: Until permanent stairs are available, provide one temporary stair between floors, located near the center of the building.
- G. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 1 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 2 02100 Section "Site Preparation."
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with 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 Contractor. Carefully remove and turn over Architect's sign to the Architect.
 2. Where area is intended for landscape development, in an area that has been used as a compacted temporary road bed, remove soil and aggregate fill that do not comply with requirements for landscaping fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section 01770 "Closeout Procedures."

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and equal products.
- B. Related Sections include the following:
 - 1. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Equal Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equal products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.

- h. Identification of items that require early submittal approval for scheduled delivery date.
- 3. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
- 4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified materials or products cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

- c. If Contractor's Substitution Requests are repeatedly (i.e. 3 times) submitted incomplete, i.e., no definitive response to items "a" through "l", the Architect will not consider any further Substitution Requests.
- C. Equal Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of an equal product request. Architect will notify Contractor of approval or rejection of proposed equal product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Use product specified if Architect cannot make a decision on use of an equal product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section 01330 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.
 - 9. Materials Stored Off Site: Unless otherwise provided in the Contract Documents, the

Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment under the following conditions:

- a. The contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location.
- b. A Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party.
- c. The Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect or Owner.
- d. The materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner.
- e. Compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Warranty start for mechanical and electrical equipment being date of substantial completion.
- D. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications

establish "salient characteristics" of products.

7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Equal Products" Article to obtain approval for use of an unnamed product.

E. Product Selection Procedures:

1. Products and Manufacturers: In particular instances there may only be a single product or manufacturer appropriate for use on the project, in which case where Specifications name a single product and manufacturer and say "no equal", provide the named product.
2. Products and Manufacturers: When one or two products or manufacturers are specified and have the words "or approved equal", the Contractor may propose to provide alternatives in the form of a Substitution Request which once reviewed by the Architect will be either accepted or rejected. If Substitution Request is submitted for approval 7 days prior to the receipt of bids and approved by the Architect, said approvals will be included in Addenda. Only those Substitution Requests listed as approved in Addenda may bid the project.
3. Products and Manufacturers: Where Specifications include a list of three (3) or more names of both products and manufacturers, provide one of the products listed that complies with requirements. No substitutions will be accepted.
4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or an equal product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
5. Visual Matching Specification: Where Specifications require matching an established Sample, product must comply with all requirements and must match Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product
6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

1.8 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution under the conditions set forth in this section under Product Selection Procedures, if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution under the conditions set forth in this section under Product Selection Procedures and when the following conditions are satisfied. If the following conditions are not satisfied,
- C. Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for

redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution requires no or only very minor revisions (as determined by the Architect), to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - NOT APPLICABLE

PART 3 - NOT APPLICABLE

END OF SECTION

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section 01310 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section 01330 "Submittal Procedures" for submitting surveys.
 - 3. Division 1 Section 01770 "Closeout Procedures" for submitting Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by professional engineer.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction

indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

2.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on RFI, "Request for Interpretation."

2.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required

dimensions.

3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

2.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Submit a final property survey certifying exact locations of site improvements including building(s), parking lots, roadways and utilities including structure elevations, top and invert, distances from property lines, and with any variation from the original civil staking and layout and utility drawings identified.

2.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling unless shown otherwise on drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 - C. Install products at the time and under conditions that will ensure the best possible results.
 - D. Maintain conditions required for product performance until Substantial Completion.
 - E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
 - G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
 - H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 - I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

2.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Pre-installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

2.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste.

Mark containers appropriately and dispose of legally, according to regulations.

- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

2.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section 01400 "Quality Requirements."

2.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

2.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- B. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 1 Section 01290 "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Mark the Architect's punch-list so-as-to identify those items that are still outstanding and uncorrected at the time of submission.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark 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 Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for Project.
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - f. Remove labels that are not permanent.
 - g. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - i. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - h. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - i. Replace parts subject to unusual operating conditions.
 - j. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - k. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - l. Leave Project clean and ready for occupancy.

END OF SECTION

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- B. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Digital Record Drawings.
 - 2. Digital Record Specifications.
 - 3. Digital Record Product Data.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of digitally scanned marked-up Record Prints.
- B. Record Specifications: Submit one copy of digitally scanned Project Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one digitally scanned copy of each Product Data submittal.
- D. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one clean set of blue- or black-line white prints of the Contract Drawings and Shop Drawings and one copy of the project manual (specification) at the job site for the sole purpose of recording changes to the drawings and specifications.
- B. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - 1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - 2. Accurately record information in an understandable drawing technique.
 - 3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
- C. Content: Types of items requiring marking include, but are not limited to, the following:
 - 1. Dimensional changes to Drawings.
 - 2. Revisions to details shown on Drawings.
 - 3. Locations and depths of underground utilities.
 - 4. Revisions to routing of piping and conduits.
 - 5. Revisions to electrical circuitry.
 - 6. Actual equipment locations.
 - 7. Duct size and routing.
 - 8. Locations of concealed internal utilities.

9. Changes made by Change Order or Construction Change Directive. (Posted on Documents.)
 10. Changes made following Architect's written orders, i.e. ASIs. (Posted on Documents.)
 11. Details not on the original Contract Drawings. (Posted on Documents.)
 12. Field records for variable and concealed conditions.
 13. Record information on the Work that is shown only schematically.
 14. Changes made in response to Contractor's questions, i.e. RFIs. (Posted on Documents.)
- D. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - E. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - F. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - G. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable. Where posting is required, post on Drawing Set and in Specifications on sheets or pages adjacent to or on top of where modification applies.
 - H. Attachment method shall be taped at top only, so as to access original underneath.
 - I. Digitally scan all documents and provide on CD Rom to Architect.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Maintain one clean copy of the project manual (specification) at the job site for the sole purpose of recording changes to the drawings and specifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Digitally scan all documents and provide on CD Rom to Architect.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
- B. Maintain one clean set at the job site for the sole purpose of recording changes to the drawings and specifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications and Record Drawings where applicable.
- C. Digitally scan all documents and provide on CD Rom to Architect.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours. Architect's representative will review Record Documents with the project superintendent each month to determine to his satisfaction whether or not Record Documents are being kept up to date. Failure to do so will result in the delay of processing pay request until Record Documents are brought up to date.

END OF SECTION

SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit three copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE

Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual,

insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number.

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OPERATION AND MAINTENANCE DATA
01782-3

2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.

5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service: Some equipment and products require maintenance by the manufacturer, supplier or subcontractor, i.e., an authorized service representative, as part of the warranty. The General Contractor shall ensure that said maintenance work is done and provide copies of service reports to the Owner.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of Record Drawings in Division 1 Section 01781 "Project Record Documents."
- G. Comply with Division 1 Section 01770 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01820 - DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training digital media.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual for Owner's use.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section 01400 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Instructor: Engage a qualified instructor to prepare instruction program and training modules, and

to coordinate between Contractor and Owner for number of participants, instruction times, and location.

- B. Instructor shall demonstrate to Owner's personnel how to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 02100 - SITE PREPARATION

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 work of this section.

1.2 DESCRIPTION OF WORK

- B. Perform site preparation work as shown and specified. Site preparation includes, but is not limited to the following:
 - 1. Protection of existing trees to remain
 - 2. Removal of trees and other vegetation.
 - 3. Stripping and stockpiling of topsoil.
 - 4. Clearing and grubbing.
 - 5. Removing above grade improvements.
 - 6. Removing below grade improvements.
 - 7. Installation of erosion control devices.

1.3 JOB CONDITIONS

- A. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing. Leave all protection in place and maintain until construction work has been completed and all danger of damage has passed. Protection shall be removed only after approval is given by Architect.

1.4 QUALITY ASSURANCE

- A. **The General Contractor shall obtain (*In accordance with ADEM Admin. Code Chapter 335-6-12*) an ADEM storm water permit from the State of Alabama. An NPDES construction site also includes construction sites, irrespective of size, whose stormwater discharges have a reasonable potential to be a significant contributor of pollutants to a water of the State, or whose stormwater discharges have a reasonable potential to cause or contribute to a violation of an applicable Alabama water quality standard as determined by the Department. The General Contractor shall include in Base Bid all permit fees associated to obtain this permit. The Contractor shall submit a Notice of Registration, the fee and develop a Construction Best Management Practices Plan (CBMPP) prior to construction and shall maintain all erosion control measures until the permit is relinquished.**
- A. The Contractor shall use care when working near existing and future installed Best Management Practice (BMP) structures to prevent damage to the structures resulting in erosion and storm water runoff containing silt and soil from the site. The Contractor shall walk the site and verify the condition of the BMP structures during the execution of the work. Any repair work that is deemed necessary as a result of damage caused by the Contractor shall be the responsibility of the Contractor and shall be performed prior to payment of the next scheduled payment application.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Soil Erosion and Sediment Control Items: Items including silt fence, wattles, inlet protection, sand bags and other erosion control items are to meet the requirements of Section 665 of the Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOTSSHC), latest edition.

PART 3 - EXECUTION

3.1 EROSION CONTROL

- A. Prior to the starting of any work, install erosion control measures as required in the Erosion Control or Best Management Practice Plan. Maintain all erosion control measures in place during full construction period and until such time as the site is substantially vegetated. Install erosion control measures in accordance with Section 665 of the Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOTSSH), latest edition, and the manufacturer's recommendations. Inspection of the silt fence shall be daily, and repair or replacement must be made promptly as required. Any sediment collected by the erosion control measures must be removed when it reaches 6" in height. Erosion control measures shall be removed only after approval is given by the Architect. Removal of erosion control measures is to be carried out by the Contractor who installed the measures.

3.2 SITE CLEARING

- A. General: Remove vegetation, improvements or obstructions interfering with installation of new construction and within limits indicated on the Drawings. Remove all demolished items from the site. Removal includes digging out stumps and roots. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction.
- B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing. Completely remove stumps, roots and other debris protruding through ground surface. Do not grub inside the drip line of trees to remain. On site burning is not permitted.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 8" loose depth and thoroughly compact to a density equal to adjacent original ground.
- D. Positive drainage must be maintained or installed by the Contractor to insure that storm water runoff flows to the proper drainage structure or swale.
- E. Restore all areas disturbed by construction activities and which are outside the limits of clearing as indicated on the drawing to their original condition. The expense for this work will be borne by the contractor. The work must be in accordance with the directions of the Architect.

3.3 STRIPPING TOPSOIL

- A. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2" in diameter, and without weeds, roots and other objectionable material. Strip topsoil to its full depth at all areas to be regraded, resurfaced or paved in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping. Where trees are indicated to be left standing, stop topsoil stripping at drip line, unless directed otherwise, to prevent damage to main root system. Stockpile topsoil in storage piles in a location acceptable to the Architect. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust. Maintain topsoil storage piles separate from other stockpiled soil materials.

3.4 SITE IMPROVEMENTS

- A. Remove above grade and below grade improvements necessary to permit construction, and other work as indicated. Abandonment or removal of certain underground pipe or conduits are shown on the civil drawings and is included under work of those sections. Removal of abandoned underground piping or conduit interfering with construction is included under this section.

3.5 DISPOSAL OF WASTE MATERIAL

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated materials, trash and debris, and legally dispose of it off Owner's property site, in area approved by all local authorities and ADEM.

END OF SECTION

SECTION 02200 – EARTHWORK

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 work of this section.
- B. **Geotechnical Report is included at the end of this section and is an integral part of this specification.**

1.2 DESCRIPTION OF WORK

- A. Extent of earthwork is indicated on drawings.
 - 1. Rough grading
 - 2. Preparation of subgrade for building slabs and walks is included as part of this work.
 - 3. Drainage fill course for support of building slabs is included as part of this work.
- B. Excavation for Mechanical/Electrical Work: Refer to Division 15 and 16 sections for excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances; not work of this section.
- C. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- D. Testing and Inspection Service:
- E. The **Owner** will select a firm for soil testing and inspection service for quality control testing during earthwork, and Owner to pay costs.
- F. Retesting of rejected materials and installed work shall be done at the Contractor's expense.
- G. Referenced Standards: Where the term "Referenced Standard" is used in these Project Specifications, it shall be interpreted as **referring to the current edition of "Standard Specifications for Highway Construction, 2018 or latest edition" of Alabama Department of Transportation** ". Referenced Divisions of the "Standard" are hereby made a part of this Project Specification insofar as they may be termed applicable. In no case will requirements for "Method of Measurement" and "Basis of Payment" be considered as applicable to this Project Specification.

1.3 JOB CONDITIONS

- A. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
- B. 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.
- C. Use of Explosives: The use of explosives is not permitted.
- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
 - 1. Perform excavation within drip-line of large trees to remain by hand and protect the root system from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 – PRODUCTS [NOT APPLICABLE]

PART 3 - EXECUTION

3.1 GENERAL

- A. Prior to the start of excavation and fill placement, the site should be cleared of existing improvements. Additionally, remnant elements associated with previously demolished structures, should be removed. Demolition should include removal of pavements, slabs, and all below grade structures including basement slabs, foundations, and walls. Utility lines will require routing or removal, as appropriate.
- B. Any existing fill materials that are encountered in the planned building area should be completely removed, plus 10 feet beyond.
- C. Areas that are at final grade, or that will require new fill placement, should be evaluated through proofrolling, prior to new fill placement or construction.
- D. Vegetation, topsoil, rootmat, and all organic materials should be completely removed from the site. Excavations resulting from demolition and vegetation removal should be backfilled in a controlled manner with engineered fill.

3.2 FILL PLACEMENT

- A. All material used as structural fill should be relatively free of organics and other deleterious materials. Soil fill should exhibit a Liquid Limit less than 50, a Plasticity Index less than 30, and a maximum dry density of at least 100 pcf. Soil fill should contain no more than 30% rock, and individual rock fragments in the fill should be less than 4 inches in largest dimension.
- B. Soil fill must be placed in an environment free of excess water. Therefore, free-draining granular material (such as ALDOT # 57 crushed aggregate) should be used as the initial lift(s) of fill in areas containing water seepage.
- C. Soil fill should be placed in lifts not exceeding eight inches in loose measure. Individual lifts of fill should be moisture conditioned to within $\pm 2\%$ of the optimum moisture content and compacted to a minimum of 98% of the Standard Proctor (ASTM D -698) maximum dry density.
- D. Soil may require wetting or drying to achieve proper compaction. Thinner lifts and manually operated equipment will be required to achieve proper compaction in limited access areas such as utility trenches and around manholes and inlets.
- E. Soil compaction testing should be performed during fill placement. Testing will give an indication of the contractor's performance with regard to soil density and moisture content requirements established in the project specifications. Compaction testing should be performed at random locations on each lift of fill placed to provide statistically relevant testing data. The frequency of density testing should be at least one test per lift for every 2,500 square feet of fill placed in building areas and 10,000 square feet in pavement and sidewalk areas (minimum of 3 tests per lift). Each lift of fill placed in utility trenches should be tested on 50-foot centers. A minimum of 3 tests should be performed on all fill lifts.
- F. Following construction, the foundations and underlying soils should be isolated from sources of excess water. Grades adjacent to the structure should be adjusted so that surface water flows away from the foundations. In no case should water be allowed to pond over newly-constructed footings. Roof drains and downspouts from the new buildings should be directed away from the foundations. Additionally, soils adjacent to foundations should consist of properly compacted, engineered fill to minimize water infiltration. The on-site soils contained fine-grained particles and will be adversely affected by excess water.
- G. To reduce the potential for water migration through the floor slab, ground-supported slabs should be underlain by a capillary break consisting of a minimum of 4 inches of compacted, free-draining, coarse, granular material (such as ALDOT #57 crushed stone). Depending on the type of floor coverings to be used, the owner may also elect install a vapor barrier typically consisting of 10 mil polyethylene sheeting. The sheeting will reduce the infiltration of water vapor through the slab and the potential for damage to floor coverings. Note, that the use of a vapor barrier will increase the potential for plastic shrinkage cracking during curing of the concrete slab.

3.3 EXCAVATION

- A. Excavation is Unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- B. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
- C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect/Engineer, shall be at Contractor's expense.
- D. 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 Architect/Engineer.
- E. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect/Engineer.
- F. Additional Excavation: When excavation has reached required sub-grade elevations, notify Architect/Engineer who will make an inspection of conditions.
- G. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect/Engineer.
- H. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.
- I. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
- J. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- K. Dewatering: See civil drawings for drainage plan recommendation for controlling ground water during initial construction phase. Prevent surface water from flowing into excavations and from flooding project site and surrounding area.
- L. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades 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.
- M. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- N. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
- O. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
- P. Dispose of excess soil material and waste materials as herein specified.
- Q. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
- R. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

- S. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.
- T. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.
- U. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.
- V. Except as otherwise indicated, excavate for exterior waterbearing piping (water, steam, condensate, drainage) so top of piping is not less than 2'-6" below finished grade.
- W. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
- X. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.
 - 1. Concrete is specified in Division 3.
- Y. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
- Z. Excavation for utilities shall conform to manufacturer's recommendations for the type material used.
- AA. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.4 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698; and not less than the following percentages of relative density determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
 - 1. Structures, Building Slabs and Steps and Pavements: Compact top 6" of subgrade and each layer of backfill (not exceeding 8" maximum) or fill material to not less than 98% of maximum density.
 - 2. Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material to not less than 90% of maximum density for cohesive soils and 90% of relative density for cohesionless soils.
 - 3. Walkways: Compact top 6" of subgrade and each layer of backfill or fill material to not less than 95% of maximum density.
- C. 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, to prevent free water appearing on surface during or subsequent to compaction operations.
- D. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - 1. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.5 BACKFILL AND FILL

- A. General: Place acceptable soil material in layers to required subgrade elevations, for each area

classification listed below.

1. Utility Trenches backfill according to manufacturer's recommendation for the type material used.
 2. In excavations, use satisfactory excavated or borrow material.
 3. Under grassed areas, use satisfactory excavated or borrow material.
 4. Under structures, building slabs, steps and pavements and after grading operations, thoroughly mix top 6" of subgrade and compact to a density not less than 98% of maximum density.
 5. Under walks and pavements, use satisfactory excavated or borrow material, or combination of both.
 6. Under building slabs, use drainage fill material.
- 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, dampproofing, waterproofing, and perimeter insulation.
 2. Inspection, testing, approval, and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of trash and debris.
- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- D. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- E. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.
- F. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- G. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to 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.

3.6 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. 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.
- C. 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 0.2' 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' 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 0.10' above or below required subgrade elevation.
- D. Grading Surface or 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 1/2" when tested with a 10' straightedge.
- E. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.7 BUILDING SLAB DRAINAGE COURSE

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
- C. When a compacted drainage course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.8 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow approved testing laboratory to inspect and approve subgrades and fill layers before further construction work is performed.
 1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), or ASTM D 2922 (nuclear method) as applicable.
 2. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect/Engineer.
 3. Paved Areas Subgrade: Make at least one field density test of subgrade for every 10,000 sq. ft. of paved area, but in no case less than 2 tests. In each compacted fill layer, make one field density test for every 10,000 sq. ft. of overlaying paved area, but in no case less than 2 tests
 4. Building Slab Subgrade: Make at least one field density test of subgrade for every 2500 sq. ft. of paved area or building slab, but in no case less than 2 tests. In each compacted fill layer, make one field density test for every 2500 sq. ft. of overlaying building slab or paved area, but in no case less than 2 tests.
 5. Foundation Wall Backfill: Take at least 2 field density tests, at locations and elevations as directed.
- B. If in opinion of Architect/Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.9 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish 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, re-shape, 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.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated materials, trash and debris, and legally dispose of it off Owner's property site, in area approved by all local authorities and ADEM.

END OF SECTION



Report of Geotechnical Subsurface Investigation

Knox Street Community Park

N. Knox Street

Troy, Alabama 36081

Our Job No. A26114.00675.000

Report of Geotechnical Subsurface Investigation

N. Knox Street Community Park

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Troy, Alabama 36081
Our Job No. A26114.00675.000

Prepared For:

Mr. Jason Reeves
City of Troy
P.O. Box 549
Troy, Alabama 36081

Prepared By:

UES Professional Solutions 18, LLC (UES)
P.O. Box 241702
Montgomery, Alabama 36124

334-213-5647
www.teamues.com

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Table of Contents

1.0 Introduction	1
2.0 Summary	2
3.0 Evaluation	4
3.1 Site Location.....	4
3.2 Site Conditions	4
3.3 Site Geology and Subsurface Stratigraphy.....	4
3.4 General Construction Information.....	5
4.0 Recommendations - Site Preparation	6
4.1 "Controlled Areas"	6
4.2 Stripping.....	6
4.3 Surface Drainage	6
4.4 Site Examination	6
4.5 Subgrade Improvements.....	6
4.6 Proof Rolling.....	7
4.7 Fill Earth	7
4.8 "Select Fill"	7
4.9 "Engineered Fill"	7
5.0 Recommendations - Shallow Spread Foundations and Ground Supported Floor Slabs	8
5.1 Maximum Net Allowable Soil Bearing Pressures.....	8
5.2 Minimum Foundation Dimensions	8
5.3 Settlement.....	8
5.4 Foundation Construction	8
5.5 Acceptance of Foundation Bearing Levels.....	9
5.6 Floor Slab Bearing Conditions.....	9
5.7 Acceptance of Floor Slab Bearing Levels	9
5.7 Seismic Design Parameters	9
5.9 Control/Expansion Joints	9
6.0 Recommendations - Pavements.....	10
6.1 Reference	10
6.2 Subgrade Support Values.....	10
6.3 Traffic Data.....	10
6.4 Subgrade Improvements.....	10
6.5 Light to Medium Duty Pavement Sections	10
6.6 Trash Dumpster Loading Areas.....	11
6.7 Concrete Pavement Construction Joints	11
6.8 Material Thicknesses.....	11



7.0 Recommendations - General	12
7.1 Utility Trenches	12
7.2 Grading and Drainage Improvements	12
7.3 Vertical Cuts	12
7.4 Cut and Fill Slopes	12
7.5 Quality Control	12
8.0 General Comments	13
9.0 Signatures.....	14

Attachments :

- Vicinity Map
- Boring Plans
- Test Boring Log
- Laboratory Test Data
- Notes and References
- Investigative Procedures
- Unified Soil Classification Chart
- General Terms and Conditions



1.0 Introduction

UES Professional Solutions 18, LLC (UES) is pleased to provide this report of our subsurface investigation for the proposed Knox Street Community Park development in Troy, Alabama. The scope of this investigation included 4 soil test bores in the proposed building and pavement areas. The quantity and location of the test bores were taken in accordance with the authorized scope of work. The intent of this investigation was to evaluate the subsurface conditions with respect to the development of the sites for support of the proposed new building and pavements.

This report has been prepared in accordance with generally accepted current standards of geotechnical engineering practices and no other warranties are expressed or implied. The recommendations of this report are based on our professional judgment considering the proposed construction as described by this report and the data available to us. The construction should include follow-up geotechnical monitoring and construction materials testing by our firm. It is important that we confirm the expected subsurface conditions based on the soil boring data during the construction phase. This report is presented on the basis that all of our recommendations will be followed.



2.0 Summary

Generally, the subsurface investigation indicated conditions which should be compatible with the planned development provided the site preparation and construction are completed in accordance with the recommendations which follow in this report. Please note that our recommendations are site specific and may not be suitable for other types of structures or other locations.

A total of 4 test bores were completed to evaluate the subsurface stratigraphy. Beneath 6" of organic topsoil, the test bores penetrated in-situ earth described as cohesive clayey sand, plastic clay, and non-cohesive sand and silty sand. The predominate sand earth is of a marginal to good drainage classification. The predominate clay earth is of a poor drainage classification. The test bores indicated moderate to strong soil strengths and consolidation characteristics which are expected to be compatible with the planned type of construction provided the recommendations in this report are followed.

The test bores did not encounter groundwater during or twenty-four hours after drilling. The test bores had caved at depths ranging from 1.9 to 13.9' below ground surface (bgs) twenty-four hours following drilling. The groundwater condition at this site is subject to seasonal variation and is expected to fluctuate. We do not anticipate that the groundwater condition will affect the construction or long-term performance of this project. Shallow groundwater (if any) encountered during construction can be controlled with shallow drainage ditches, sump pumps, and/or permanent underdrains.

Following stripping and/or the removal of any cut earth, we recommend that the planned building and pavement "control areas" be processed and compacted to 98% of the materials ASTM D698 standard density. Following compaction of the existing subgrade, the control areas should be proof rolled. Any areas which fail to compact or fail to pass a proof roll should be undercut to expose firm soil. The clean, non-organic suitable sections of the undercut earth may be stockpiled and reused for "engineered fill". The reuse of the native material should be limited to material that has a plasticity index of less than 20.

Following proper site preparation, the project can use conventional design and construction techniques to develop a shallow spread foundation system for support of the planned building. The spread foundations can be designed to bear transitional between the in-situ earth (compacted as required) and new "engineered fill" earth using net allowable soil bearing pressures of up to 1,500 pounds per square foot for continuous foundations and 2,000 pounds per square foot for isolated square foundations.



The pavement sections may be developed using locally available materials and conventional construction techniques. The pavement sections may be constructed using a crushed aggregate base and high stability bituminous pavement section, a granular soil base and high stability bituminous pavement, or a concrete pavement section placed directly over an improved layer of the subgrade earth.



3.0 Evaluation

3.1 Site Location

The site subject of this report is located at on the northeast corner of the N. Knox Street and Three Notches Street in the City of Troy, Pike County, Alabama. Our field personnel utilized the provided site plan and a survey grade GPS to locate the test bores and to record the ground elevation at each bore location. The accuracy of the GPS can be influenced by tree canopies, building structures, atmospheric conditions and other interferences. The horizontal locations and elevations at the bore locations have not been field surveyed and should be considered approximate. The enclosed boring plan further describes the test bore locations.

3.2 Site Conditions

The project site consisted of a baseball field. The proposed project site is surrounded by existing road and pavement areas. The project site is clear and open with grass vegetation surrounded by chain link fencing.

Local terrain is described as gently sloping. Surface water is expected to flow over the site and discharge beyond the area planned for development.

Site access was described as fair. There was no difficulty mobilizing our truck-mounted drilling equipment over the site access to the test bore locations.

3.3 Site Geology and Subsurface Stratigraphy

Geologically, the site is located in the Coastal Plain Province in an area underlain by the Clayton Formation, a member of the Midway Group placed in the Paleocene Epoch of the Tertiary Period. Typically, this formation yields sandy fossiliferous limestone, silty calcareous clay, and fine to coarse quartz sand.

Beneath 6" of clayey sand topsoil, the test bores penetrated in-situ earth described as cohesive clayey sand, plastic clay, and non-cohesive sand and silty sand. Laboratory analyses confirmed "SM" & "SC" Unified Soil Classifications of the predominate silty sand and clayey sand earth with a plasticity indices of NP to 8. The penetration resistance values, "N", ranged from 6 to 26 blows per foot indicating relative densities of loose to very firm in the predominate sand earth and a consistency of very stiff in the predominate clay earth. Moisture tests indicated water contents ranging from 7.6 to 31.5%. The test bores were terminated in the in-situ earth at depths ranging from 6.5 to 20' (bgs).

The test bores did not encounter groundwater during or twenty-four hours after drilling. The test bores had caved at depths ranging from 1.9 to 13.9' below ground surface (bgs) twenty-four hours following drilling.

The enclosed test boring records further describe the subsurface stratigraphy, Unified Soil Classifications, penetration resistance values, moisture contents, caved depths, and boring



termination depths.

3.4 General Construction Information

The following data was extrapolated from the provided construction information. The construction data described in this section was considered in the formulation of our recommendations; therefore, any significant changes, additions or modifications to the planned development may have a significant impact on our recommendations. We ask that we be advised of any significant errors, omissions, or revisions in the construction data to permit further comment as needed.

We understand the proposed development will include conventional type building construction along with related grading, drainage, and pavement improvements. The building will include single-story height, shallow foundations, concrete floor slab on grade and CMU, steel or wood frame type construction with brick or metal veneer siding. Specific structural loading information was not provided. We anticipate that maximum concentrated loads will be less than 50 kips and that wall loads will be less than 2 kips per linear foot.

Specific pavement design criteria were not available. The pavements are expected to be subjected to a light to medium duty traffic classification for the new parking lot and drive areas with a moderate volume of automobiles and occasional medium to heavy weight trucks.

Specific grading information was not provided. Based on existing grades, we anticipate earth cutting/filling thicknesses will be minimal to establish subgrade elevation. Fill earth required to establish subgrade elevation is expected to originate from on-site cuts and/or local off-site borrow sources.

One of the enclosed boring plans further describes the planned development.



4.0 Recommendations - Site Preparation

4.1 "Controlled Areas"

Define those areas throughout and 5' beyond the proposed building and pavement areas and throughout significant slopes as "controlled areas".

4.2 Stripping

Remove all vegetation, topsoil, and otherwise unsuitable materials (if any) from the "controlled areas". All unsuitable materials should be wasted off-site or in non-structural areas.

4.3 Surface Drainage

Maintain the "controlled areas" in a drained condition that will ensure the continual removal of surface water that may flow over the construction areas. Temporary site drainage, which is critical for the project, can be enhanced by the installation of the final site drainage structures during the early phases of the site development.

4.4 Site Examination

Prior to the placement of fill earth and following removal of cut earth, the "controlled areas" should be examined by UES personnel. This examination should use proof rolling with construction equipment, test pits, supplemental test bores, visual examinations, etc., as needed to determine the presence, location, and extent of any localized organic, weak, and/or otherwise unsuitable soil conditions which may exist at the site. During the site examination, the presence of existing underground utilities, buried structures, etc., if any, should be identified. All existing utilities, buried structures, etc., which may interfere with the construction or performance of the development should be removed and backfilled with "engineered fill" earth or modified as directed by the project's geotechnical consultant. Surficial weak soil conditions should be undercut to expose a firm level of soil followed by backfilling with engineered fill.

4.5 Subgrade Improvements

Following stripping and/or the removal of any cut earth, we recommend that the "control areas" be processed and compacted to 98% of the materials ASTM D698 standard density. Following compaction of the existing subgrade, the "control areas" should be proof rolled. Any areas which fail to compact or fail to pass a proof roll should be undercut to expose firm soil. The clean, non-organic, suitable sections of the undercut earth may be stockpiled and reused for engineered fill. The reuse of the native material should be limited to material that has a plasticity index of less than 20. The site work contractor should be prepared to moisture condition the on-site material (wetting or drying) to achieve proper compaction. Site preparation can be best accomplished during the normally drier summer and fall seasons.



4.6 Proof Rolling

Proof rolling should be completed using rubber-tired construction equipment or a partially loaded dump truck weighing 30 tons. Proof-rolling should include a minimum of 2 passes in perpendicular directions over the "controlled areas". Areas which yield excessively should be corrected in accordance with our recommendations. Do not proof roll when the subgrade soil is saturated.

4.7 Fill Earth

Fill earth required to establish subgrade elevation in the "controlled areas" should consist of the clean, non-saturated, and non-organic sections of the native earth exhibiting plasticity indices of less than 20, typical of the majority of that penetrated by the test bores. Moisture conditioning and processing may be required to develop "engineered fills" using sections of the native on-site soil.

4.8 "Select Fill"

Fill earth originating from an off-site borrow source should be designated as "select fill" and should consist of a silty clayey sand or clayey sand that meets the following criteria.

"Select fill" Composition

Sieve Requirements	% Passing
3"	100
No. 4	75 - 100
No. 200	20 – 45
Liquid Limit	40 max
Plasticity Index	6 to 15
Maximum Dry Unit Weight Based on ASTM-698 Standard Density Test	≥ 105 pcf

4.9 "Engineered Fill"

Unless otherwise specified, all fill earth, to include "select fill" earth, placed in the "controlled areas" should be designated as "engineered fill". Place fill earth in thin lifts not to exceed 8" loose measure and thoroughly compact each lift of fill to at least 98% of the materials ASTM D-698 standard density. At the time of densification, the moisture content of the "engineered fill" should be within +/-3% of optimum water content. Following acceptance for moisture and density, any "engineered fill" areas which are disturbed should be retested prior to the placement of additional fill earth or structures.



5.0 Recommendations - Shallow Spread Foundations and Ground Supported Floor Slabs

5.1 Maximum Net Allowable Soil Bearing Pressures

2,000 pounds per square foot for isolated square foundations.

1,500 pounds per square foot for continuous wall foundations.

Note: Foundations should bear transitional in the firm in-situ earth (compacted as required) or new "engineered fill" exhibiting "N" values of 8 or greater.

5.2 Minimum Foundation Dimensions

Depth - The bottom of perimeter building wall and column foundations below outside finish grades should be at least 18". Increase depth as required to extend foundations through weak soil conditions. Any weak soil may be replaced with non-reinforced lean concrete (mud sill).

- The bottom of interior building foundations below the top of ground supported floor slabs should be at least 18". Increase depth as required to extend foundations through weak soil conditions. Any weak soil may be replaced with non-reinforced lean concrete (mud sill).

Width - Isolated square foundations - 30".

- Continuous wall foundations - 18".

- Turned down slab edges - 12"

Note: All foundations should be sized for total load but should not be less than the minimums described preceding in this report. The use of the recommended minimum foundation depths considers that adequate surface drainage is provided at finish subgrade elevation.

5.3 Settlement

The planned building structure will be subjected to total long term settlements of less than 1" with differential settlements of less than 1/2". The building foundations should be designed to tolerate these estimated settlements.

5.4 Foundation Construction

Do not permit foundation bearing soil to become saturated or dry excessively. Caution should be used not to disturb the foundation bearing level of soil. The bearing level of soil exposed in foundation trenches should be compacted to 98% standard density. Soils that fail to compact to the specified requirements will need to be undercut to a firm level and backfilled with lean concrete.



5.5 Acceptance of Foundation Bearing Levels

All foundation excavations should be examined by the project geotechnical consultant prior to the installation of the foundation reinforcement and concrete. All unacceptable conditions should be corrected in accordance with the geotechnical consultant's recommendations.

5.6 Floor Slab Bearing Conditions

The floor slab should bear on the properly compacted in-situ earth or new “engineered fill”. Provide a minimum 4" layer of compacted ALDOT 825 crushed stone base, no. 8910 crushed stone, ALDOT 821 granular soil, “select fill” or other suitable compactable granular fill between the subgrade layer and the slab. Provide a minimum 10 mil vapor barrier beneath the floor slab. Care should be taken not to damage the vapor barrier during placement of the floor slab concrete.

5.7 Acceptance of Floor Slab Bearing Levels

All floor slab bearing levels should be examined by the projects geotechnical consultant prior to the placement of the vapor barrier. All unacceptable conditions should be corrected in accordance with the geotechnical consultant's recommendations.

5.8 Seismic Design Parameters

The design parameters for the ASCE/SEI 2022 are as follows for the Knox Street Community Park site in Troy, Alabama.

$$S_s = 0.15 \quad S_{MS} = 0.2 \quad S_{DS} = 0.13$$

$$S_1 = 0.076 \quad S_{M1} = 0.16 \quad S_{D1} = 0.11$$

Site Class D

Seismic Design Category B for Use Group I, II, or III and Seismic Design Category C for Use Group IV

5.9 Control/Expansion Joints

A liberal amount of control/expansion joints should be used in the concrete floor slabs, masonry walls and brick veneer walls to reduce the effects of the normal amounts of differential settlement and concrete shrinkage expected. The design and location of the control and construction joints should be in accordance with the recommendations of the Portland Cement Association.



6.0 Recommendations - Pavements

6.1 Reference

Alabama Department of Transportation (ALDOT), Standard Specifications For Highway Construction - 2026 Edition.

6.2 Subgrade Support Values

Based on estimated California Bearing Ratios (CBR) for the native earth and/or “select fill” earth at subgrade elevation, a design CBR value of 7 is recommended.

6.3 Traffic Data

Specific design pavement traffic data was not available. The proposed pavement areas are expected to be subjected to a light to medium duty traffic classification including a moderate volume of automobiles and occasional medium to heavy weight service and delivery trucks. Please contact our office if specific pavement design data is available so that we may modify our pavement recommendations (if required).

6.4 Subgrade Improvements

Thoroughly mix and compact the top 6" of subgrade to 100% standard density.

Slope subgrade to provide positive drainage to side drainage ditches, underdrains, and/or storm drains to prevent the entrapment of water in the subgrade layer.

6.5 Light to Medium Duty Pavement Sections

Based on an estimated CBR value of 7 and a 20-year design life, the light to medium duty pavement sections may be developed using a crushed aggregate base and high stability bituminous pavement section, a granular soil base and high stability bituminous pavement section, or a concrete pavement section placed over the improved subgrade layer as described below.

6.5.1 Crushed Aggregate Base and High Stability Bituminous Pavement Section

- 2.0" - ALDOT Section 424-A 342 bituminous wearing surface.
- 1 - ALDOT Section 401-A bituminous prime coat.
- 6" - ALDOT Section 825 crushed aggregate soil base (100% modified density).
- 6" - ALDOT Section 230 modified roadbed (100% standard density).



6.5.2 Granular Soil Base and High Stability Bituminous Pavement Section

- 1.25" - ALDOT Section 424-A 340 bituminous wearing surface.
- 1" - ALDOT Section 405 bituminous tack coat.
- 1.5" - ALDOT Section 424-B 635 bituminous binder.
- 1" - ALDOT Section 401-A bituminous prime coat.
- 8" - ALDOT Section 821 granular soil base (95% modified density).
- 6" - ALDOT Section 230 modified roadbed (100% standard density).

Note: All bituminous pavements should be designed on the fine side of the restricted zone to reduce the permeability of the asphalt pavement.

6.5.3 Concrete Pavement Section

- 5" - 3500 psi compressive strength (550 psi flexural strength) concrete, maximum 4" slump.
- 6" - ALDOT Section 230 modified roadbed (100% standard density).

6.6 Trash Dumpster Loading Areas

A minimum 6" thick concrete pad should be developed in front and beneath trash dumpster areas to provide support for the sanitation vehicles during handling of the dumpsters.

6.7 Concrete Pavement Construction Joints

The design and location of construction joints should be in accordance with the recommendations of the Portland Cement Association. We recommend a maximum control joint spacing of 12'. All joints should be filled with a suitable flexible joint compound to prevent water intrusion at the joints.

6.8 Material Thicknesses

All material thicknesses referred to in this section are completed thicknesses.



7.0 Recommendations - General

7.1 Utility Trenches

All utility trenches (new and existing) extending through the "controlled areas" should be back-filled with native soil compacted as "engineered fill".

7.2 Grading and Drainage Improvements

Incorporate finish grades, side drainage ditches, underdrains, etc., to reduce the possibility of ponding surface water within 5' of foundations and significant slopes.

7.3 Vertical Cuts

Vertical cuts greater than 4' or cuts required to remain open for extended periods of time should be sloped or braced as required for the protection of workmen entering deep excavations. Heavy construction traffic and stockpiling of excavated earth or other materials should not be permitted near the top of open unsupported excavations. Current OSHA regulations should be adhered to with respect to excavations for this project.

7.4 Cut and Fill Slopes

Permanent cut and fill slopes should perform satisfactorily as steep as 2.5(H):1(V) in the native earth or "select fill". All slopes should be protected from erosion using suitable vegetation or pavements.

7.5 Quality Control

A qualified geotechnical and construction materials testing consultant should provide the following services;

- 7.5.1 Verify the results of stripping, proof-rolling, and correction of weak soil conditions, and quality and density of "engineered fill", and conditions of the foundation, floor slabs, and pavement subgrade bearing levels.
- 7.5.2 Complete soil particle size, Atterberg limits, and laboratory compaction tests on each different type of fill earth used in the "controlled areas".
- 7.5.3 Complete a minimum of 3 field density tests per each 1' of vertical thickness of fill placed in the building "controlled areas" and 1 test every 1500 square feet in the pavement areas. Also, a minimum of 1 field density test should be taken for each 50 linear feet per each 2' of vertical thickness of fill placed at utility trenches extending through "controlled areas".
- 7.5.4 Test all structural concrete in accordance with the guidelines established by the American Concrete Institute.
- 7.5.5 Quality assurance testing on the improved subgrade and base materials should be in accordance with the State of Alabama Department of Transportation.



8.0 General Comments

The scope of this study did not include sampling or testing for an environmental analysis or assessment for this site. If an environmental assessment of this site is desired we should be contacted for further comment.

The comments of this report do not consider local flood conditions. The local flood condition/elevation (if any) should be determined and considered in the design of this project.

The comments of this report are based upon our interpretation of the construction information supplied by others, the data collected at the 4 soil test bores, and our visual examination of the site. The evaluation of subsurface conditions based on the 4 test bores taken with this study requires a certain amount of interpolation. Improper site preparation, extremes in climatic conditions, significant changes in locations, grades, time, etc., can each affect groundwater, surface, and subsurface conditions. If conditions are encountered as the construction advances which vary significantly from those described by this report, we should be contacted for supplemental comment.

The scope of this investigation is not intended to establish volumetric estimates of the various subsurface materials at the site. Volumetric estimates may require a large number of test bores placed on a close grid to establish reliable cross sections. If volume estimates are required of us for the design/development of this project to advance, please contact us for further comment.

We are available to provide a review of the final plans and project specifications with respect to their compatibility with the contents of this report. Furthermore, our firm would appreciate the opportunity to continue to serve as the geotechnical consultant and to provide the construction materials testing and monitoring for this project.



9.0 Signatures

Thank you for selecting UES to provide the geotechnical services for this project. We are available to answer any questions concerning our findings and recommendations. If we can be of any further assistance, please contact our office.

Sincerely,



Kevin A. Burnett, E.I
Engineering Intern

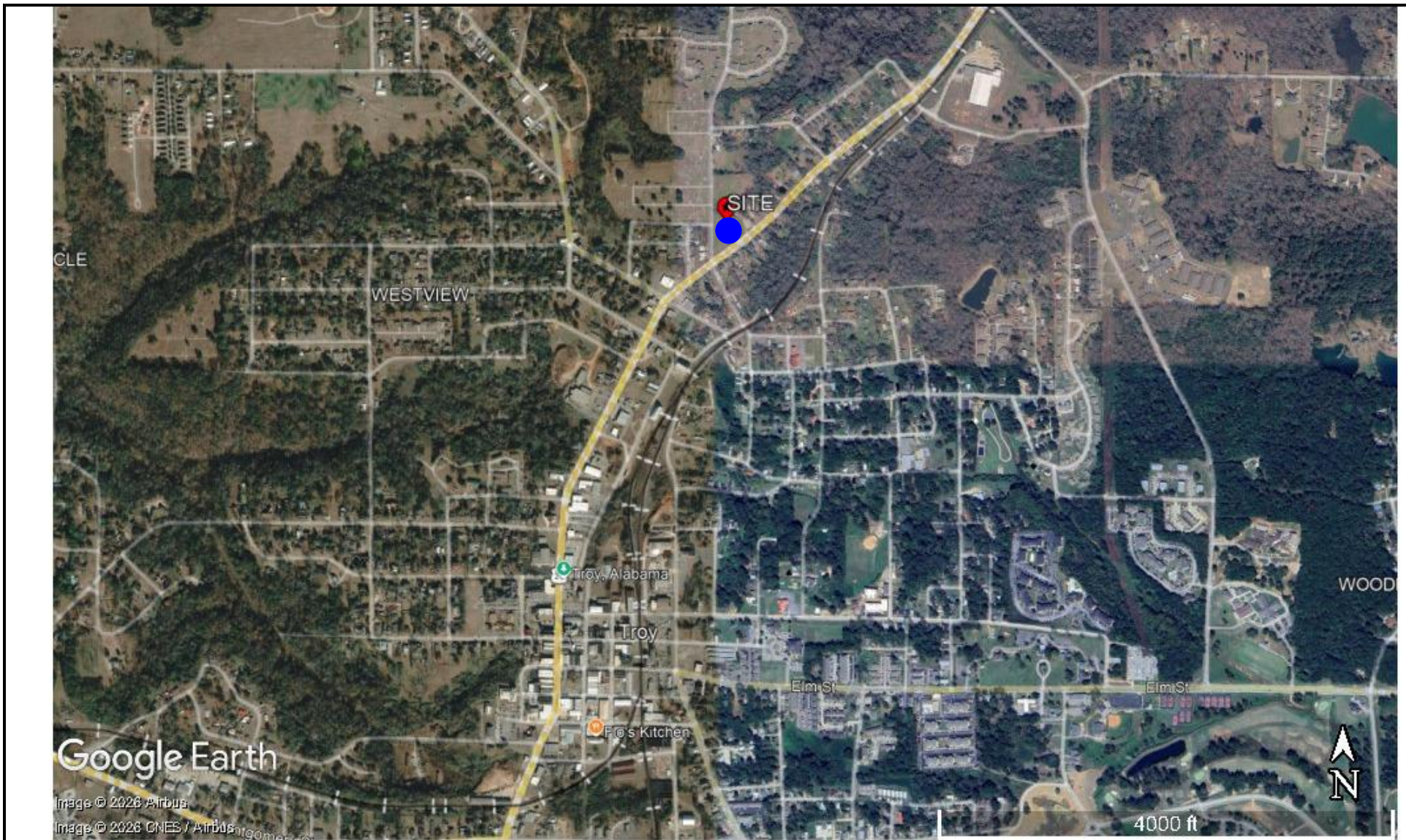


J. Stephen Carmichael, P.E.
Licensed AI #15730



Report Distribution: 1 – Mr. Jason Reeves(email)
1 – Mr. Warwick Woodham, Architect (email)





SITE VICINITY MAP



LEGEND

Source: Google Earth

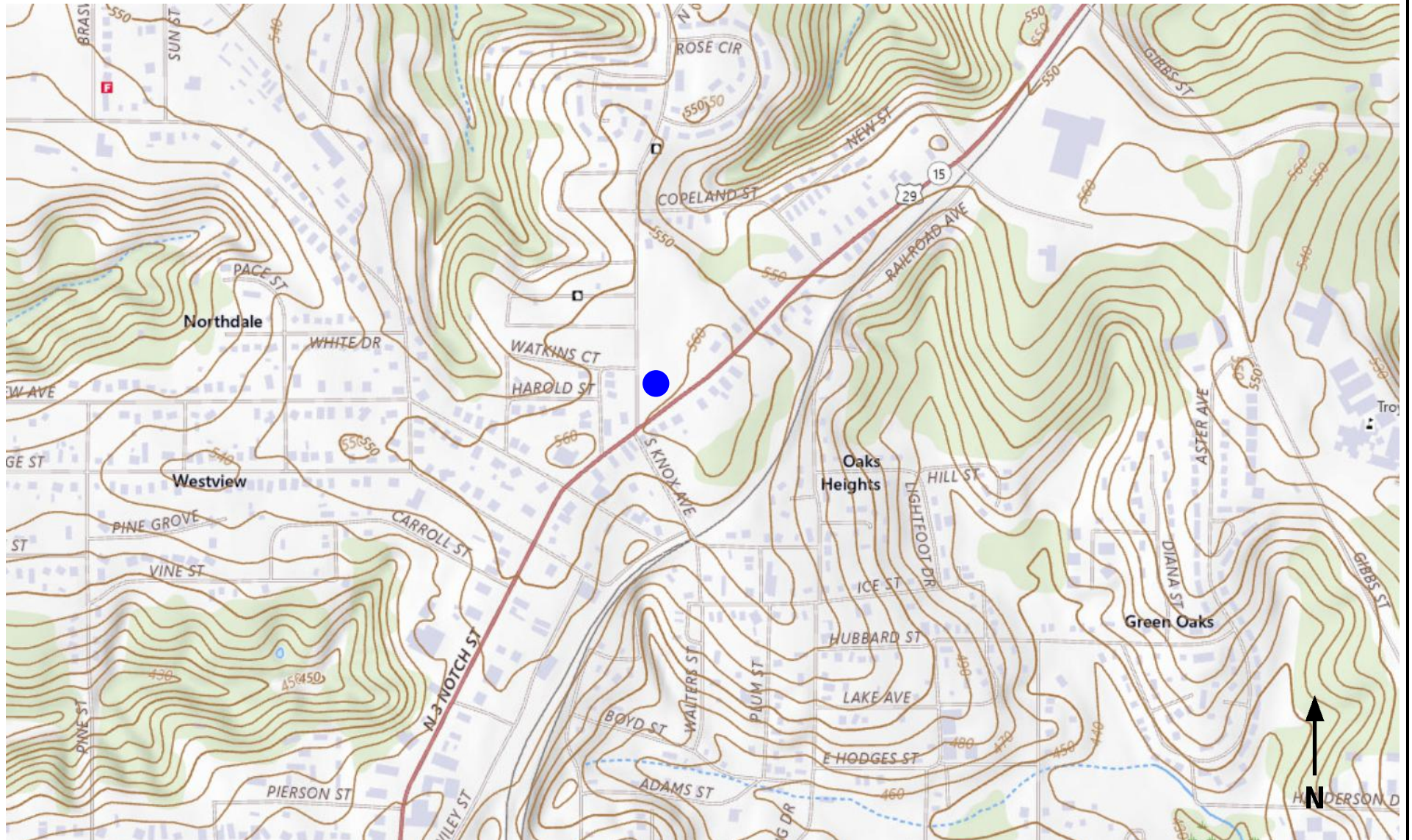
● - Site Location

Scale: Not to Scale

PROJECT

Geotechnical Exploration
Knox Street Community Park
Troy, AL

Project No.: A26114.00675.000



SITE TOPOGRAPHIC MAP



LEGEND
Source: USGS Topobuilder

 -Site location

PROJECT
Geotechnical Exploration
Knox Street Community Park
Troy , AL

Project No.: A26114.00675.000



AERIAL VIEW



LEGEND

Source: Google Earth

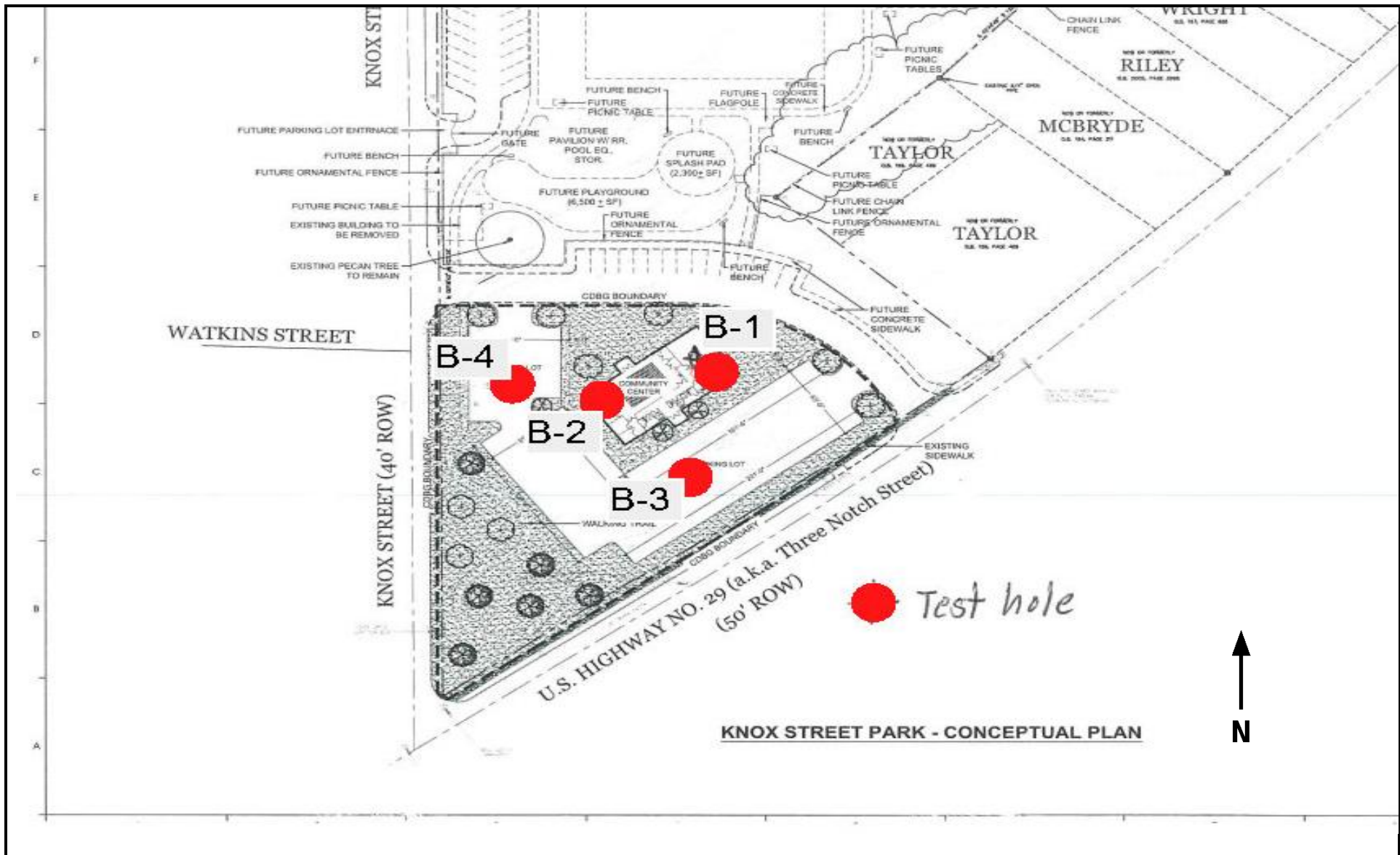
● - Bore locations

Scale: Not to Scale

PROJECT

Geotechnical Exploration
Knox Street Community Park
Troy, AL

Project No.: A26114.00675.000



BORING PLAN

LEGEND
 Source: Provided from Client
 Red dot - Bore locations
 Scale: Not to Scale

PROJECT
Geotechnical Exploration
Knox Street Community Park
Troy, AL

Project No.: A26114.00675.000



INVESTIGATIVE FIELD PROCEDURES

Penetration Testing & Split Barrel Sampling: A standard 2.0" O.D. (1.4" I.D.) split barrel sampler is first seated 6" to penetrate any loose cuttings and then driven an additional 12" with blows of a 140-pound hammer falling 30". The number of blows required to drive the sampler the final foot is recorded and designated the "penetration resistance" (N). (ASTM D- 1586)

Soil Boring (SB): The test bore is advanced by a drilling rig utilizing 5-5/8" O.D. (2-1/4" I.D.) hollow stem augers. Soil samples are obtained with a standard split-tube sampler by driving the sampler thru the hollow auger. Collected soil specimens are sealed in air tight containers and delivered to the laboratory to confirm the drillers classifications. (ASTM D- 1452 & 1586)

Auger Boring (AB): Steel flight augers are utilized to advance the test bore. The soils are visually classified and sampled from the cuttings which are brought to the surface. (ASTM D-1452)

Undisturbed Sampling (UD): Relatively undisturbed soil samples are obtained by forcing a section of 3" O.D. 16-gauge steel tubing into the soil at the desired sample location. The tube is then sealed from moisture loss and delivered to the laboratory for possible laboratory testing.

Rotary-Wash Boring (RB): The drilling operation is performed by first setting a length of casing and then advancing the test bore by "jetting" a bentonite solution thru drill rods and bit.

Core Drilling (CD): The test bore is advanced thru rock by coring which utilizes a diamond bit and a double tube, swivel type core barrel. (ASTM D-2113)

Monitoring Wells (MW): Temporary or permanent wells may be installed to provide the accurate water table determination and periodic monitoring. The well is constructed with 1.5" to 4" diameter PVC pipe meeting current standards for monitoring well construction.



NOTES AND REFERENCES

Soil descriptions are based on the predominate constituent of the material and are further described by appropriate modifiers in reverse order of their importance. For example, a predominate sand soil containing clay would be described as “clayey sand”. Additional modifiers may be used, beginning with the least important constituent such as “silty clayey sand”, etc.

Water levels shown on the test boring logs reflect those levels measured at the specified time and date indicated on the logs. These water levels are subject to seasonal fluctuation and can be effected by local surface drainage and/or rainfall during the monitoring period.

The following table describes soil relative densities and consistencies based on penetration resistance values (N) determined by the Standard Penetration Test. The “N” values are estimated for hand tool bores using a portable dynamic cone penetrometer.

	N	Relative Density
Sand	0 – 3	Very Loose
	4 – 9	Loose
	10 – 19	Firm
	20 - 29	Very Firm
	30 - 49	Dense
	50+	Very Dense
	N	Consistency
Clay and Silt	0 - 2	Very Soft
	3 - 5	Soft
	6 - 11	Firm
	12 - 17	Stiff
	18 - 29	Very Stiff
	30 - 49	Hard
	50+	Very Hard

Laboratory Test References

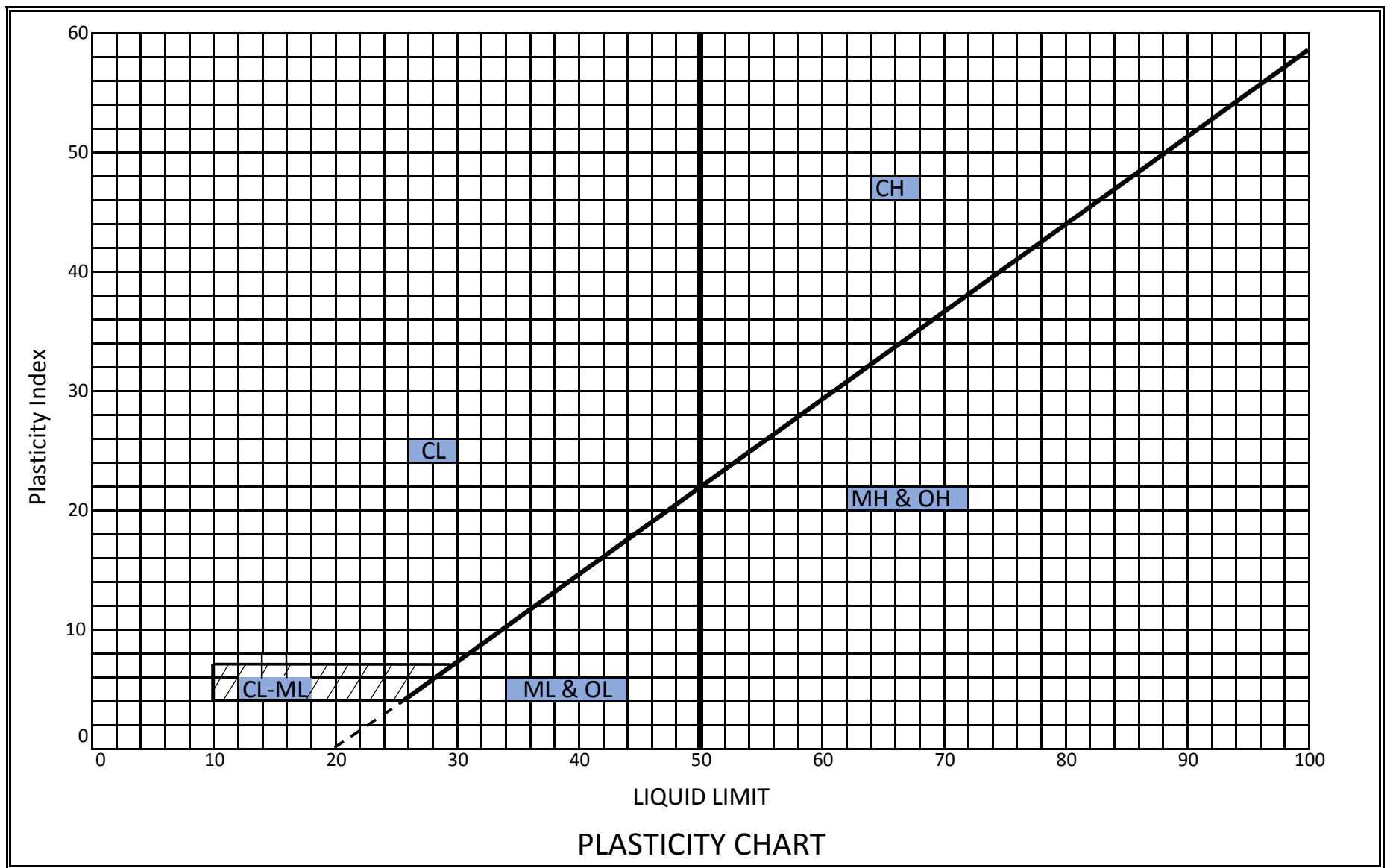
Test	Reference
Moisture Content.....	ASTM D-854
Particle Size Analysis.....	ASTM D-421,422,1140
Atterberg Limit.....	ASTM D-423, 424
Specific Gravity.....	ASTM D-2216
Compaction Test.....	ASTM D-698, 1557
California Bearing Ratio Test.....	AASHTO T-193
Triaxial Shear Test.....	ASTM D-2850
Unconfined Compression Test.....	ASTM D-2166
Consolidation Test.....	ASTM D-2435
Soil Permeability Test.....	ASTM D-2434



The Unified Soil Classification System

Major divisions			Group symbol	Typical names	Classification criteria for coarse-grained soils		
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u \geq 4$ $1 \leq C_c \leq 3$		
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_u < 4$ or $1 > C_c > 3$)		
			GM	d/u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $I_p < 4$	Above A line with $4 < I_p < 7$ are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below A line with $I_p > 7$		
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u \geq 6$ $1 \leq C_c \leq 3$		
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_u < 6$ or $1 > C_c > 3$)		
			SM	d/u	Silty sands, sand-silt mixtures	Atterberg limits below A line or $I_p < 4$	Limits plotting in hatched zone with $4 \leq I_p \leq 7$ are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above A line with $I_p > 7$		
Fine-grained soils (more than half of material is smaller than No. 200)	Silts and clays (liquid limit < 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain-size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5%-GW, GP, SW, SP More than 12%-GM, GC, SM, SC 5 to 12%-Borderline cases requiring dual symbols.			
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays				
		OL	Organic silts and organic silty clays of low plasticity				
	Silts and clays (liquid limit > 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	$C_u = D_{60}/D_{10}$ $C_c = D_{30}^2/D_{10}D_{60}$			
		CH	Inorganic clays or high plasticity, fat clays				
		OH	Organic clays of medium to high plasticity, organic silts				
	Highly organic soils	Pt	Peat and other highly organic soils				





GENERAL TERMS AND CONDITIONS

SECTION 1: BINDING AGREEMENT

1.1 By accepting the Proposal, Client accepts and agrees to be bound by all terms set forth in the Proposal and these General Terms and Conditions and any applicable addendum attached hereto. Client acknowledges and agrees that these General Terms and Conditions include certain state-specific terms and conditions that are applicable based on the location where the Services (as hereinafter defined) are to be performed. Attached hereto are State-Specific Addenda, each corresponding to a particular state or region.

1.2 If the Services are performed in Florida, Texas, California, Nevada, Oregon, Washington or Arizona, the State-Specific Addendum attached hereto is incorporated into and made a part of these General Terms and Conditions.

1.3 In the event of any conflict between these General Terms and Conditions and the terms of the applicable State-Specific Addendum, the terms of the State-Specific Addendum shall govern and control for Services performed in that state or region.

1.4 The Proposal and these General Terms and Conditions (collectively, the "Agreement") represent and contain the entire and only agreement and understanding among UES Professional Solutions, LLC, a Florida limited liability company and its affiliates (the "Company") and Client with respect to the subject matter of this Agreement and supersede any and all prior and contemporaneous oral and written agreements, understandings, representations, inducements, promises, warranties, and conditions among the parties.

SECTION 2: SERVICES

2.1 The Company is responsible for providing the services described under the Scope of Services ("Services") of the Proposal to which these General Terms and Conditions form a part. The term "the Company" as used herein includes all the Company's agents, employees, professional staff, and subcontractors.

2.2 The Company shall provide revised or additional services, including changes to the Services necessary due to changed or unforeseen conditions, only in accordance with a written addendum or change order (collectively, "Change Order") to the Agreement agreed to by the Company and Client, and only to the extent set forth in that Change Order.

2.3 The Company shall not be responsible for any delays, fees or costs associated with adverse or unusual weather conditions that prevent the Services from being safely conducted.

2.4 The Company shall provide the personnel, equipment, Level D personal protective equipment (as defined by the Occupational Safety and Health Administration ("OSHA")), and other materials necessary to provide the Services. The Company, at its sole discretion, may retain subcontractors or other third parties to assist it in the provision of the Services.

2.5 The terms "Project" and "Site" as used interchangeably in these General Terms and Conditions refer to the land and/or construction project on which or to which the Company is to provide Services under this Agreement.

2.6 The Company shall perform all Services hereunder as an independent contractor, and nothing contained herein shall be deemed to create any association, partnership, joint venture, or relationship of principal and agent or master and servant, or employer and employee between the parties hereto or any affiliates or subsidiaries thereof, or to provide either party with the right, power or authority, whether express or implied, to create any such duty or obligation on behalf of the other party.

SECTION 3: PROFESSIONAL STANDARD OF CARE

3.1 The Company will provide its Services under this Agreement in a manner consistent with the level of professional care and skill ordinarily exercised by similar professionals practicing contemporaneously under similar conditions in the locality of the Project. NO OTHER WARRANTY CONCERNING THE SERVICES THE COMPANY PROVIDES UNDER THE AGREEMENT OR ANY ADDENDUM OR CHANGE ORDER, EXPRESS OR IMPLIED, IS MADE, AND ALL OTHER WARRANTIES, INCLUDING THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED TO THE FULL EXTENT PERMITTED BY APPLICABLE LAW.

3.2 Client understands that subsurface investigations may involve drilling, boring, excavating or sampling through varied subsurface soil and water strata which, consistent with the prevailing standard of professional care, may result in the unavoidable or inadvertent cross-mingling of soil and water and any hazardous substances or constituents contained in them, and that this risk cannot be eliminated despite the exercise of professional care. IF SUBSURFACE INVESTIGATIONS ARE PART OF THE SERVICES, CLIENT WAIVES ANY CLAIM AGAINST THE COMPANY, AND SHALL INDEMNIFY, DEFEND, AND HOLD THE COMPANY HARMLESS FROM ANY CLAIM OR LIABILITY FOR INJURY OR LOSS ARISING FROM CROSS-CONTAMINATION RELATED TO SUCH SUBSURFACE EXPLORATIONS.

3.3 The Company will take reasonable precautions to minimize damage to the Site, but it is understood by Client that, in the normal course of the provision of the Services, including sampling or drilling, some damage to, or alteration of the Site is possible. The repair of such damage shall not be part of the Services unless explicitly specified in writing in the Agreement.

3.4 Execution and delivery of this Agreement by the Company is not a representation that the Company has visited the site, become generally familiar with local conditions under which the work is to be performed, or correlated personal observations with the requirements of the Scope of Services.

3.5 Client's payment in full of the amount owed for Services rendered shall be taken to mean that Client is satisfied with and has accepted the Company's Services.

SECTION 4: RESPONSIBILITIES

4.1 Client is responsible for providing the Company with a clear understanding of the project's nature and scope. Client shall supply the Company with sufficient and adequate information, including, but not limited to, maps, site plans, reports, surveys, plans and specifications, and designs, to allow the Company to properly complete the Services. Client assumes all liability for information not provided to the Company that may affect the quality or sufficiency of the Services.

4.2 Client acknowledges that the Company's responsibilities in providing the Services is limited to those services described in the Proposal, and the Client hereby assumes any collateral or affiliated duties necessitated by or for those Services. Such duties may include, but are not limited to, the provision of any required notices to any third party, or the securing of necessary permits or permissions from any third parties required for the Company's provision of the Services.

SECTION 5: SITE ACCESS AND SITE CONDITION

5.1 Client will grant or obtain at its expense lawful and safe access to the Site as needed for the Company to perform the Services and will notify all affected persons and entities in writing of the Company's presence. The access shall be adequate to allow the Company to conduct the Services, including bringing and storing equipment and tools on the Site and any necessary access to exterior and interior areas. The Company shall not be responsible for any delays, fees or costs caused by delayed or restricted access that prevents or slows the delivery of the Services. If the Site is not owned or operated by Client or the Client does not otherwise have the authority to grant the Company lawful access, Client shall be responsible for obtaining, at its own expense, an access agreement for the Site and any facilities located thereon and are necessary to perform the Services. The Company reserves the right to delay, without penalty, any Site visit and the provision of Services if a site access agreement, in the Company's reasonable judgment and discretion, would impose conditions, liabilities or risks on the Company in excess of those set forth in these General Terms and Conditions or the Agreement. IF THE SITE IS NOT OWNED BY CLIENT, CLIENT AGREES TO DEFEND, RELEASE, AND HOLD THE COMPANY, INCLUDING ITS OFFICERS, DIRECTORS, SHAREHOLDERS, EMPLOYEES, AGENTS, AFFILIATES AND SUCCESSORS (THE "COMPANY INDEMNITEES") HARMLESS FOR ANY AND ALL CLAIMS, LOSSES, DAMAGES OR LIABILITIES ALLEGED BY THE SITE OWNER OR THE SITE OWNER'S EMPLOYEES, AGENTS, CONTRACTORS OR OTHER PERSONS OR ENTITIES ARISING FROM THE COMPANY'S PERFORMANCE OF SERVICES AT SUCH SITE.

5.2 Client shall be responsible for the safety of the Site where the Project is conducted and for providing a safe environment for the Company to provide the Services. The Company shall be responsible for the safe and compliant conduct of its personnel at the Site and shall also comply with the reasonable and lawful work rules for the Site. As required by applicable laws, the Company will prepare a site-specific Health and Safety Plan (HASP) applicable to its personnel for the Services provided at the Site. The Company shall not be responsible for the safety of other personnel at the Site, nor shall it be responsible for ensuring that the Site complies with environmental, health and safety laws, or reporting any unsafe conduct or non-compliance that it

may observe. If the Company encounters conditions at the Site that are unsafe for its personnel, it reserves the right at its sole discretion to suspend or halt work until such conditions are cured. The Company shall not be responsible for any fees, costs or damages associated with any safety-related delays. Unless otherwise provided for in the Agreement, the Company shall not work in conditions that require personal protective equipment beyond that classified as Level D by OSHA, unless otherwise identified in the Proposal.

5.3 Client is responsible for accurately identifying to the Company in writing the existence and location of all subterranean structures and utilities on or affecting the Site and the Services. The Company will take reasonable precautions to avoid affecting subterranean structures and utilities disclosed to it in writing by Client. If included in the Agreement, Client may authorize the Company to conduct applicable private utility identification and clearance requirements on behalf of Client.

5.4 Unless otherwise stated in the Proposal, any soil or groundwater monitoring activities that are included in the Services are based on the assumption that soil borings and monitoring wells can be installed using standard truck-mounted drilling equipment, the locations are accessible to such equipment, and that surface conditions at each location consists of non-reinforced asphalt or concrete not exceeding six (6) inches in thickness and no concrete or asphalt cutting will be required. If the Company encounters materially different conditions at the Site, the Company shall inform Client, and a Change Order shall be agreed to that addresses any changes in schedule, fees or costs associated with the changed conditions.

SECTION 6: HAZARDOUS SUBSTANCES AND ENVIRONMENTAL CONDITIONS

6.1 Client represents it has informed the Company of all known or suspected Hazardous Substances on, under or near the Site of which it is aware, and that it has provided the Company with all studies, reports, investigations, or similar documents in its possession about the environmental conditions at the Site, including any documents and correspondence involving Federal, State or local environmental, health or safety regulatory notifications.

6.2 For purposes of the Agreement and these General Terms and Conditions, the term “Hazardous Substances” includes materials defined or regulated as hazardous substances, hazardous materials, hazardous wastes, hazardous constituents, solid wastes, pollutants, or toxic substances under any Federal, State or local environmental, health, safety or natural resources law, statute, regulation or ordinance, including but not limited to petroleum products, polychlorinated biphenyls, per- and polyfluoroalkyl substances, asbestos, and any other material or substance listed or identified by the United States Environmental Protection Agency or any similar State or local agency as presenting a potential danger to health, safety or the environment.

6.3 Except to the extent required by law, the Company shall not be responsible for making any disclosures to governmental agencies or the Site owner regarding the presence or release of Hazardous Substances on, under, from or around a Site.

6.4 **FOR ENVIRONMENTAL INVESTIGATION, GEOTECHNICAL AND REMEDIATION PROJECTS**, the discovery of Hazardous Substances or other environmental conditions on, under or near the Site not contemplated within the Services may constitute a changed condition, necessitating a Change Order. Although unlikely, Client acknowledges that such a discovery of Hazardous Substances may make it necessary for the Company to take immediate measures to protect the health and safety of its employees and other persons, or to arrange for others to do so, including and up to delaying or terminating work. Client agrees to compensate the Company for all expenses incurred or caused by the discovery of unanticipated Hazardous Substances or environmental conditions encountered at the Site, including but not limited to those related to worker protection and exposure, emergency response actions and equipment decontamination.

6.5 **FOR ENVIRONMENTAL INVESTIGATION AND REMEDIATION PROJECTS**, all substances on, in, or under Site, or obtained from Site as samples or as byproducts of the sampling process, shall be Client’s property. The Company shall not be required to sign or certify a waste manifest, disposal ticket, or similar document relating to the transportation or disposal of wastes or Hazardous Substances. The Company may serve as Agent for Client if requested under a separate agreement and authorization. Client shall be considered the “generator” of any hazardous or other wastes, as that term is defined in the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 et seq. and agrees that it shall assume all duties as “generator” of any waste material associated with the Services. Further, Client agrees that the Company is not a generator, storer, treater, transporter, arranger, or disposer of wastes or Hazardous Substances and shall not be so identified on any document.

FOR GEOTECHNICAL PROJECTS, all substances on, in, or under the Site, or obtained from the Site as samples or as byproducts of the sampling process, shall be Client’s property. Unless otherwise expressly specified in the Agreement or the Services, the characterization, management and disposition of substances, including Hazardous Substances, generated during the Services (including, but not limited to, wastes, samples, produced soils or fluids, cuttings, or protective gear or equipment, etc.) is the sole responsibility of Client. Client shall be considered the “generator” of any hazardous or other wastes, as that term is defined in the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 et seq. and agrees that it shall assume all duties as “generator” of any waste material associated with the Services. Further, Client agrees that the Company is not and shall not be identified as a generator, storer, treater, transporter, arranger, or disposer of wastes or Hazardous Substances on any document. Unless specifically provided for in the Agreement, the Company shall not have any responsibilities with respect to the storage or preservation of samples, and Client agrees that the Company is not responsible or liable to Client for any loss of samples that are shipped to a testing facility or retained in storage.

6.6 The Company shall not have custody of any monitoring wells or permanent sampling locations installed as part of the Project, and shall not be responsible for proper maintenance, repair, or closure of such wells, unless otherwise provided for in the Agreement.

6.7 CLIENT AGREES TO DEFEND, INDEMNIFY, RELEASE, AND HOLD THE COMPANY INDEMNITEES HARMLESS FROM ANY AND ALL CLAIMS, LOSSES, DAMAGES OR LIABILITIES (INCLUDING ATTORNEY’S FEES AND CONSULTANTS’ FEES, COSTS OF DELAY OF THE SERVICES, AND ANY COSTS ASSOCIATED WITH POSSIBLE REDUCTION TO THE VALUE OF THE PROJECT OR THE SITE IN WHICH IT IS SITUATED) ARISING FROM (I) THE COMPANY’S DISCOVERY OF OR ITS EMPLOYEES’ OR SUBCONTRACTORS’ EXPOSURE TO HAZARDOUS SUBSTANCES OR SUSPECTED SUBSTANCES RELATED TO THE SERVICES, TO THE EXTENT CAUSED BY CLIENT’S NEGLIGENCE ACTS, OMISSIONS OR WILLFUL MISCONDUCT; (II) ANY DISCLOSURES THE COMPANY IS REQUIRED TO MAKE BY LAW REGARDING HAZARDOUS SUBSTANCES OR ENVIRONMENTAL CONDITIONS AT A SITE; (III) ANY CLAIMS MADE ALLEGING THAT (A) THE COMPANY IS AN OWNER OR OPERATOR OF THE SITE AT WHICH THE SERVICES ARE RENDERED; (B) THE COMPANY IS THE GENERATOR, STORER OR TREATER OF HAZARDOUS SUBSTANCES AT SUCH SITE; OR (C) THAT THE COMPANY ARRANGED FOR THE TRANSPORTATION OR DISPOSAL OF ANY HAZARDOUS SUBSTANCES FROM THE SITE; (IV) ANY VIOLATION BY CLIENT OF ANY FEDERAL, STATE OR LOCAL LAW, REGULATION, ORDER, DECREE OR ORDINANCE RELATED TO HAZARDOUS SUBSTANCES; OR (V) ANY CLAIMS MADE BY THIRD-PARTIES WITH RESPECT TO ALLEGED EXPOSURES TO OR DAMAGES CAUSED BY HAZARDOUS SUBSTANCES AT OR FROM THE SITE OR DURING OR RELATED TO ANY PROJECT OR THE PROVISION OF SERVICES, TO THE EXTENT CAUSED BY CLIENT’S NEGLIGENCE OR WILLFUL MISCONDUCT.

SECTION 7: REVIEWS, INSPECTIONS, TESTING, AND OBSERVATIONS

7.1 If the Services include oversight, monitoring or observation of work being conducted by third parties (other than the Company subcontractors), such Services shall be conducted solely to determine that the work being overseen, monitored, or observed is in general conformity to the contractual requirements between Client and such third parties. Client shall have sole responsibility and authority to reject, suspend or stop the work of such third parties, or modify or terminate any agreement between Client and such third parties.

7.2 The Company shall not have the responsibility or authority to stop, suspend, or modify the work of such third parties, and does not guarantee that work it inspects conforms in all respects to the design, or to applicable laws, statutes, regulations, rules or codes, and it shall have no liability for design or construction defects, or the failure of Client’s designers or contractors to comply with their contractual obligations.

7.3 Neither the activities of the Company pursuant to this Agreement, nor the presence of the Company or its employees, representatives, or subcontractors on the Project Site, shall be construed to impose upon the Company any responsibility for means or methods of work performance, superintendence, sequencing of construction, or safety or environmental conditions or compliance at the Project Site. Client acknowledges that Client or its contractor is solely responsible for Project jobsite safety and compliance with environmental, health and safety laws.

7.4 Client is responsible for scheduling all inspections and construction materials testing (“CMT”) activities of the Company. The Company will not be responsible for tests and inspections that it does not perform due to Client’s failure to timely schedule work. Client shall at the time of execution of the Agreement provide the Company with a proposed schedule for tests and inspections the Company shall perform. Client will give reasonable notice of all changes to that schedule. The Company shall not be required to conduct any tests or inspections on less than 72 hours written notice, nor after normal business hours or on weekends or holidays.

SECTION 8: BILLING AND PAYMENT

8.1 The Company will submit invoices to Client monthly or upon completion of Services. Invoices will show charges for different personnel and expense classifications. Partially completed items of work for which a fee has been specified may be billed based upon the percentage of completion as estimated by the Company. Reimbursable expenses, those outside of the scope of the proposed Services, will be charged to the Client at cost plus an applicable fee. Payment is due 30 days after presentation of invoice and is past due 31 days from invoice date. Client agrees to pay a finance charge of the lesser of one and one-half percent (1 ½ %) per month, or the maximum rate allowed by law, on past due accounts. If the Company incurs any expenses to collect overdue billings on invoices, the sums paid by the Company for reasonable attorneys' fees, court costs, the Company's time, the Company's expenses, and interest will be due and owing by the Client. Client agrees that the Company may refuse to release to Client any reports, findings, data, and other work product until it has been paid in full for Services rendered.

SECTION 9: OWNERSHIP AND USE OF DOCUMENTS; INTELLECTUAL PROPERTY

9.1 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by the Company, as instruments of service, shall remain the property of the Company. Neither Client nor any other entity shall change or modify the Company's instruments of service. The Company disclaims any and all responsibility and liability for problems that may occur during implementation of the Company's plans, specifications, or recommendations when Company is not retained to observe such implementation. The Company will retain all pertinent records relating to the Services for a period of "five years or such longer period" of time required by applicable accrediting agency, unless specified in the Scope of Services following submission of the report or completion of the Services, during which period the records will be made available to the Client in a reasonable time and manner, subject to payment of a reasonable fee for the time of the Company's employees to assemble and transmit those documents.

9.2 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by the Company, are prepared for the sole and exclusive use of Client, and may not be given to any other entity, or used or relied upon by any other entity, without the express written consent of the Company. Such written consent may take the form of a "reliance letter" which must be agreed to by such other person or entity to whom the Services and instruments of service may be disclosed, and for which a separate fee will be charged. The Company shall be entitled to injunctive relief preventing/prohibiting any disclosure, reliance or attribution prohibited hereunder, and CLIENT SHALL RELEASE, INDEMNIFY, DEFEND, AND HOLD HARMLESS THE COMPANY FROM ANY LOSSES ARISING FROM OR RELATED TO SUCH UNAUTHORIZED DISCLOSURE, ATTRIBUTION OR RELIANCE. Client is the only entity to which the Company owes any duty or duties, in contract or tort, pursuant to or under this Agreement.

9.3 The Company shall retain sole and exclusive ownership of all ideas, concepts, theories, improvements, designs, original works of authorship, formulas, processes, models, software, algorithms, inventions, know-how, techniques, compositions of matter and any other information owned by the Company prior to the date of this Agreement or created or modified by the Company during the provision of the Services.

9.4 Each party may disclose to the other party certain information that it considers to be confidential ("Confidential Information") provided such information is disclosed in writing and clearly marked or, if orally disclosed, promptly thereafter reduced to writing and clearly marked "Confidential." In no event shall Confidential Information include information that: (a) is or becomes publicly available other than through a breach of the Agreement; (b) is known to the party receiving such information prior to disclosure or is independently developed by such party subsequent to such disclosure without reference to Confidential Information provided hereunder; or (c) is subsequently lawfully obtained by the party receiving such information from a third party without obligations of confidentiality. Each party agrees that it (a) will not disclose or divulge the other party's Confidential Information to any person, (b) will not use the other party's Confidential Information for its own benefit or the benefit of others, (c) will employ at least the same degree of care in protecting Confidential Information as it employs in protecting its own confidential information, and (d) will, upon termination of the Agreement, or at any time at the request of the other party, return to the other party or destroy all copies of the other party's Confidential Information. Notwithstanding the foregoing, each party may disclose the other party's Confidential Information to its employees, subcontractors and authorized agents who have a need to know such confidential information to fulfill its obligations under this Agreement. In the event a party receives a subpoena or other validly issued administrative or judicial process requesting the disclosure of the other party's Confidential Information, such party will promptly notify the other party and tender to it the defense of such demand and will cooperate (at the other party's expense) with the defense of such demand. Unless the demand shall have been timely quashed or extended, the party receiving the demand shall thereafter be entitled to comply with such demand when and to the extent required by law.

SECTION 10: RISK ALLOCATION AND INDEMNIFICATION

10.1 CLIENT AGREES THAT THE COMPANY'S LIABILITY FOR ANY DAMAGE ON ACCOUNT OF ANY BREACH OF CONTRACT, ERROR, OMISSION, OR PROFESSIONAL NEGLIGENCE WILL BE LIMITED TO A SUM NOT TO EXCEED THE GREATER OF \$50,000 OR THE COMPANY'S FEE. If Client prefers to have higher limits on contractual or professional liability, the Company agrees to increase the limits up to a maximum of (i) \$1,000,000.00 upon Client's written request at the time of accepting the Proposal provided that Client agrees to pay an additional consideration of the greater of five percent of the total fee for Services or \$1,000.00, or (ii) \$2,000,000.00 upon Client's written request at the time of accepting the Proposal provided that Client agrees to pay an additional consideration of the greater of ten percent of the total fee for Services or \$2,000.00. The additional charge for the higher liability limits is because of the greater risk assumed and is not strictly a charge for additional contractual or professional liability insurance.

10.2 CLIENT SHALL NOT BE LIABLE TO THE COMPANY AND THE COMPANY SHALL NOT BE LIABLE TO CLIENT FOR ANY PUNITIVE, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS, LOSS OF USE, AND LOST SAVINGS) INCURRED BY EITHER PARTY DUE TO THE FAULT OF THE OTHER, REGARDLESS OF THE NATURE OF THE FAULT, OR WHETHER IT WAS COMMITTED BY CLIENT OR THE COMPANY, THEIR EMPLOYEES, AGENTS, OR SUBCONTRACTORS; OR WHETHER SUCH LIABILITY ARISES IN BREACH OF CONTRACT OR WARRANTY, TORT (INCLUDING NEGLIGENCE), STATUTORY, OR ANY OTHER CAUSE OF ACTION.

10.3 As used in this Agreement, the terms "claim" or "claims" mean any claim in contract, tort, or statute alleging negligence, errors, omissions, strict liability, statutory liability, breach of contract, breach of warranty, negligent misrepresentation, or any other act giving rise to liability.

10.4 Subject to the provisions of the limitation of liability described in this Section, Client and the Company each agree to indemnify and hold harmless the other party and the other party's affiliated companies, officers, directors, partners, employees, and representatives, from and against losses, damages, and judgments, including reasonable attorneys' fees and expenses recoverable under applicable law, but only to the extent they are legally determined to be caused by a negligent act, error, or omission of the indemnifying party or any of the indemnifying party's officers, directors, members, partners, agents, employees, or subconsultants in the performance of Services. If claims, losses, damages, and judgments are legally determined to be caused by the joint or concurrent negligence of Client and the Company, they shall be borne by each party in proportion to its negligence.

10.5 Notwithstanding any other term or provision in this Agreement, in recognition of the relative risks, rewards and benefits of the work being performed by the Company to both the Client and the Company, the risks have been allocated such that the Client agrees and acknowledged that, to the fullest extent permitted by law, the total liability of the Company to the Client for any and all injuries, claims, losses, expenses, damages or claim expenses arising out of this Agreement from any cause or causes of action whatsoever, whether arising out of contract, negligence, strict liability in tort, or warranty, shall not exceed the amount specified in Section 10 of the General Terms and Conditions.

SECTION 11: INSURANCE

11.1 The Company represents it has Worker's Compensation insurance in force, that it has commercial general liability coverage in the amount of \$1,000,000.00 per occurrence and has professional liability insurance in the amount of \$1,000,000.00 per claim.

11.2 Client shall maintain such insurance as is necessary to fully underwrite Client's defense and indemnity obligations set forth herein, and shall, upon request by the Company, provide proof to the Company to verify such insurance.

SECTION 12: DISPUTE RESOLUTION

12.1 All claims, disputes, and other matters in controversy between the Company and Client arising out of or in any way related to this Agreement or any Addendum or Change Order shall be decided by binding arbitration in accordance with the Construction Industry Rules of the American Arbitration Association then obtaining, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. Notwithstanding the foregoing, the Company shall not be required to arbitrate any legal and/or equitable claims (including

statutory and equitable liens) for collection of monies due. The successful party in any such action will be entitled to recover its reasonable attorneys' fees, expert witness fees, and other claim-related expenses and court costs incurred, and also the time value at prevailing rates of its employees reasonably incurred in prosecuting or defending the claims, with any claims against the Company subject to the limitations in Section 10. For the purposes hereof, "successful party" shall mean a party who receives an award greater than fifty (50%) percent of its claimed amount.

12.2 The sole and exclusive venue for any dispute resolution proceeding shall be the location in which the Company office performing the Services is located. This Agreement shall be governed by and construed in accordance with the laws of the jurisdiction in which the Company office performing the Services is located.

12.3 Notwithstanding the foregoing, all claims, including for negligence or any other cause whatsoever that the Client has or claims to have against the Company, shall be deemed waived unless (i) Client notifies the Company of the claim or claims within thirty (30) days of discovery thereof, and (ii) if the Client contends that a claim exists against the Company for negligence or another violation of a standard of care owed by the Company, Client has first provided the Company with a written certification executed by an independent design professional currently practicing in the same discipline as the Company. The certification shall: a) identify the name of the professional; b) specify each and every act or omission that the certifier contends is a violation of the standard of care identified in this Agreement; and c) state in complete detail the basis for the certifier's opinion that each such act or omission constitutes such a violation. This certificate shall be provided to the Company not less than thirty (30) calendar days prior to the institution of any arbitration or judicial proceeding.

12.4 NOTWITHSTANDING THE FOREGOING, THE COMPANY SHALL HAVE NO LIABILITY FOR ANY CLAIM DISCOVERED BY CLIENT MORE THAN ONE YEAR AFTER DELIVERY OF THE LAST ISSUED REPORT BY THE COMPANY FOR THE SERVICES. THE PARTIES AGREE THAT THIS PROVISION IS MATERIAL TO THE DECISION OF THE COMPANY TO ENTER INTO THIS AGREEMENT, THAT IT IS A REASONABLE MEASURE TO ALLOCATE AND INSURE AGAINST RISK, AND THAT IT DOES NOT VIOLATE PUBLIC POLICY.

SECTION 13: TERMINATION

13.1 This Agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof, or in the case of a force majeure event such as terrorism, act of war, public health or other emergency. Such termination shall not be effective if such substantial failure or force majeure has been remedied before expiration of the period specified in the written notice. In the event of termination, the Company shall be paid for services performed to the termination notice date plus reasonable out of pocket termination expenses incurred or paid by the Company in connection with such termination and the winding down of its operations.

13.2 In the event of termination, or suspension for more than three (3) months, prior to completion of all reports contemplated by this Agreement, the Company may complete such analyses and records as are necessary to complete its files and may also complete a report on the Services performed to the date of notice of termination or suspension. The expense of termination or suspension shall include all direct out of pocket costs incurred or paid by the Company in completing such analyses, records, and reports.

SECTION 14: SOLICITATION OF EMPLOYEES

14.1 Client agrees that during the term of the Agreement, and for a period of one (1) year after the last date on which the Company has provided Services, Client shall not, directly or indirectly, solicit or attempt to solicit for employment, or contract directly or indirectly with, any employee of the Company except as authorized in writing by the Company.

SECTION 15: ASSIGNS

15.1 Neither Client nor the Company may assign this Agreement or assign or delegate any of its rights or obligations without the prior written consent of the other party.

SECTION 16: SURVIVAL

If any of the provisions of this Agreement is held by a court of competent jurisdiction to be illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired and will survive. Limitations of liability and indemnities will survive termination of this Agreement for the period of all applicable statutes of limitations to which they relate.

SECTION 17: MISCELLANEOUS

17.1 This Agreement may not be amended or modified except by an agreement in writing signed by the party against whom the enforcement of any modification or amendment is sought.

17.2 Failure by either party at any time to enforce any obligation by the other party, to claim a breach of any term of the Agreement or to exercise any power agreed to hereunder will not be construed as a waiver of any right, power or obligation under the Agreement, will not affect any subsequent breach, and will not prejudice either party as regards any subsequent action.

17.3 The headings in these General Terms and Conditions are for reference only and are not intended to form part of the Agreement between the Parties.

17.4 It is agreed that this Agreement is entered into by the parties for the sole benefit of the parties to the Agreement, and that nothing in the Agreement shall be construed to create a right or benefit for any third party.

17.5 To the extent that a statute of limitations for any cause of action against the Company arising from this Agreement can be modified contractually in accordance with law, and the relevant statute of limitations for any claim arising of or relating to this Agreement, or the Services provided by Company r, is greater than two (2) years, the relevant statute of limitations shall be two (2) years from the date Company last provided Services. The parties agree that this provision is material to the decision of Company to enter into this agreement, that it is a reasonable measure to allocate and insure against risk, and that it does not violate public policy. This section shall not be construed as an agreement to increase the statute of limitations for any causes of action that are otherwise barred by law.

17.6 All future services rendered by the Company at Client's request for the Project described in the Proposal (whether by Change Order, Addendum, or amendment to this Agreement) shall be conducted under the terms of this Agreement.

CLIENT APPROVAL

In the event the Client authorizes work without returning a signed copy of the Proposal, the Client agrees to be bound by the General Terms and Conditions as stated herein. The Proposal presented has been read, understood, and accepted by the Client effective as of the date that the executed Proposal is returned to the Company.

SECTION 02282 - TERMITE CONTROL

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 work of this section.

1.2 SUMMARY

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

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.

1.4 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.
- B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.
- C. Use only termiticides which bear a Federal registration number of the US Environmental Protection Agency.

1.5 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.
- B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 SPECIFIC PRODUCT WARRANTY

- A. Furnish written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites and that if subterranean termite activity is discovered during warranty period. Contractor will re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor. This includes all costs associated with re-inspections per the manufacturer's requirements, re-treatment, repair and replace damage caused by termite infestation.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION

- A. Use an emulsible concentrate termiticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of the following chemical elements and concentrations:
 - 1. Water based emulsion, uniform composition, synthetic dye to permit visual identification of treated soil, of a generic chemical type in compliance with state and federal law and regulations.
- B. Solutions as recommended by Applicator and approved for intended application by jurisdictional authorities. Use only soil treatment solutions which are not injurious to planting or persons.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.
- B. Application Rates: Water to be added to solution at job site in the presence of field Superintendent. Apply soil treatment solution at a rate as recommended by the manufacture at the following locations:
- C. Under slab-on-grade structures, treat soil before concrete slabs are placed, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab and around interior column footers.
- D. Apply chemical solution to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab and around interior column footers.
 - 1. Apply chemical solution as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply chemical solution to areas where fill is washed gravel or other coarse absorbent material.
- E. Under crawl-space and basement structures, treat soil along exterior and interior walls of foundations with shallow footings as specified above for exterior of slab-on-grade structures.
- F. Treat soil under or around crawl-space structures as follows:
 - 1. Apply chemical solution along inside of foundation walls, along both sides of interior partitions, and around piers and plumbing. Do not apply an overall treatment in crawl spaces.
 - 2. Apply chemical solution for each foot of depth from grade to footing, along outside of foundation walls, including part beneath entrance platform porches, etc.
 - 3. Apply chemical solution along the side and outside of foundation walls of porches.
 - 4. Apply as an overall treatment, only where attached concrete platform and porches are on fill or ground.
- G. At hollow masonry foundations or grade beams, treat voids.
- H. At expansion joints, control joints, and areas where slabs will be penetrated, apply chemical solution.
- I. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.
- J. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION

SECTION 02660 - WATER DISTRIBUTION SYSTEM

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 work of this section.

1.2 SCOPE OF WORK

- A. The work includes construction of the water distribution system including fire lines as shown on the Drawings.
- B. Testing and disinfection of the installed system shall be incidental to the work.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state or federal authorities having jurisdiction.
- B. Meet all requirements of the Local Water Authority and be subject to review by System inspectors.

1.4 SITE CONDITIONS

- A. Coordinate water distribution system with pavement construction.
- B. Install water mains when grade is within 6 in. of final grade.
- C. Coordinate the Work with the Local Water Authority and pay all tap fees assessed (to include valves, backflow preventers, vaults, etc.) for portions of the Work completed by the Utility Provider.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Water Main Piping:
 - 1. Water Service Piping: Ductile iron pipe or PVC pipe.
 - 2. Ductile Iron Pipe:
 - a. Manufactured in accordance with AWWA C-151, latest revision, Class 50, min.
 - b. Standard cement-lined and seal-coated with an approved bituminous seal coat in accordance with AWWA C-104, latest revision.
 - c. Approved push-on, conforming to AWWA C-111, latest revision.
- B. PVC Pipe:
 - 1. Constructed to meet the requirements of U. S. Department of Commerce Product Standard PS 22-70, and bear the National Sanitation Foundation Testing Laboratories, Inc., seal for potable water.
 - 2. For PVC piping less than 4" - Schedule 40, PVC, minimum; 150 psi minimum working pressure
 - 3. 4" or greater shall be C900 PVC piping.
- C. Fire Line:
 - 1. Fire line shall be C900 PVC piping. Encasement shall be used under drive areas.
 - 2. Connection to Main: Each hydrant shall be connected to the main pipe with a 6-inch ductile iron branch. Each hydrant shall be controlled by an independent 6-inch gate valve.
- D. Fire Hydrants:

1. All hydrants shall be Mueller Company, M & H, or an approved equal. Fire hydrants shall be equipped with traffic break away feature. Hydrants shall be painted in accordance with the requirements of AWWA C502.

E. Water Main Fittings:

1. Ductile iron fittings shall be provided in locations as shown on the plans or in locations deemed necessary by the Engineer. Ductile iron fittings 12" and smaller shall be rated for 350 psi working pressure. Fittings shall be manufactured in accordance with AWWA C153 and provided with mechanical joints. All fittings shall be provided with a thin cement lining in accordance with AWWA C104.
2. PVC Fittings: Fittings For PVC Water Mains Smaller Than 6 In. In. Dia.: As recommended by the manufacturer of the pipe furnished, suitable for use under the conditions specified for the pipe, with ring-tite or fluid-tite bells or spigots at all ends for jointing.

F. Valves and Boxes:

1. Cast Iron Valve Boxes shall be provided for all valves installed vertically and shall consist of a base covering the operating nut and head of the valve, a vertical shaft of at least 5 1/4" in diameter and a top section extending to a point even with the finish ground surface, provided with a cast iron cover marked "WATER." The valve box shall be placed concentrically over the operating nut. Precast concrete collars shall be provided around each valve box.
2. Valves 2" and Larger: Cast iron gate valves, AWWA type, the standard product of a recognized valve manufacturer such as Mueller, Iowa or M & H, constructed with an interchangeable parts system, with parts readily available, to meet the following requirements:
 - a. Iron body, bronze-mounted.
 - b. Double disc, parallel seat "O" ring seal.
 - c. 150 psi, min., working pressure.
 - d. Counterclockwise (left) opening.
 - e. 2 in. operating nut.
 - f. Non-rising stem.
 - g. Joints to be as required for pipe to be connected to.
3. Valves 2" and Smaller: Brass or bronze gate valves, conforming to Federal Specification WW-V-76.
4. Underground Valves: Two-piece, screw type, adjustable to suit the depth of bury and type of valve, with a min. shaft dia. of 5-1/4 in.
5. All mechanical joint valves and fittings shall be restrained by MEGALUG series 1100 restraint devices.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Line and Grade: Lay and maintain to the required lines and grades; with fittings, valves and hydrants at the required locations; and with joints centered and spigots plumb; and with all valve and hydrant stems plumb.
- B. Encasement: Piping under paved drive shall be encased with welded steel pipe casing.
- C. Laying Pipe:
 1. General: Before lowering pipe into trenches, grade the bottom of the ditch so that when pipe is in the ditch it will have a bearing for its entire length. Examine the pipe for defects and clean the inside. After placing pipe in ditch, wipe the bell, gasket, and spigot free from all dirt, sand and foreign material. Apply a film of lubricant to the gasket and spigot. Enter the plain

end into the socket after which force the pipe into the socket until it makes contact with the bottom of the socket.

2. A minimum of five (5) feet horizontal separation shall be used when installing water main or piping within areas of sanitary sewer lines. When the proposed water main or piping is required to cross sewer mains, the contractor shall encase the water main carrier pipe with a continuous pipe (sleeve or casing) of sufficient length, located such that a minimum five (5) foot horizontal separation exists between each end of the casing pipe and the sewer main. Where possible, water main shall be a minimum of 18 inches above the top elevation of the sewer main.
3. No. 12 THW copper locator wire shall be placed in the trench, 12 inches above the water mains and all service piping.
4. Trench Water: At times when pipe laying is not in progress, close the open ends of pipe by approved means, and permit no trench water to enter the pipe.
- D. Cutting Pipe: Cut pipe for inserting valves, fittings or closure pieces in a neat and workmanlike manner without damage to the pipe.
- E. Direction of Laying: Unless otherwise directed, lay pipe with bell ends facing in the direction of laying. For lines on an appreciable slope, face bells upgrade.
- F. Permissible Deflections: Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructing, to plumb stems, or where long radius curves are permitted, deflect as recommended by the manufacturer of the pipe.
- G. Unsuitable Conditions: Lay no pipe in water or when the trench conditions or weather is unsuitable for such work.
- H. Provide ground cover of 3 ft. min.
- I. Setting Appurtenances:
 1. Valves and Fittings: Set gate valves and pipe fittings to new pipe in the manner previously specified for cleaning, laying and jointing pipe.
 2. Valve Boxes: Firmly support cast iron valve boxes and maintain centered and plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed.

3.2 FIELD QUALITY CONTROL

- A. Hydrostatic Tests: Pressure During Test: After the pipe has been laid and partially backfilled as specified, pressure test all newly laid pipe, or any valved section of it, in accordance with Local required procedures.

3.3 CLEANING AND DISINFECTION

- A. Clean out and thoroughly flush the water distribution system piping and leave free from foreign materials of any sort prior to sterilization.
- B. Disinfect in accordance with Local required procedures and AWWA Standard C-651, latest edition.

END OF SECTION

SECTION 02720 - STORM SEWERS

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 work of this section.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state or federal authorities having jurisdiction.
- B. All locations including total jobsite: All storm drainage shall be in accordance with Local Requirements.

1.3 SUBMITTALS

- A. Submit manufacturer's data, test reports, material certifications as required.

1.4 SITE CONDITIONS

- A. Protection of Existing Utilities: Protect existing power lines, water mains, gas lines, telephone lines and other utilities. Should any functioning underground utilities be uncovered during the Work, advise for determination as to whether or not they are to be removed. Repair any damage to utility lines and restore service to original condition.
- B. Coordination and Scheduling of Work:
 - 1. Coordinate work with earthwork operations to avoid interference. Protect established construction stakes.
 - 2. Establish and maintain center-lines, grades and elevations.
 - 3. Construction of new sewers and drainage systems shall proceed as early in construction program as possible. Maintain adequate drainage of the project area at all times. Prevent flooding of adjacent roads and private properties.
- C. Temporary Drainage: Wherever possible, construct new sewers and inlets to serve the various drainage areas, and place in service. Where this is not possible, provide temporary drainage facilities as required. These may include temporary connections into completed sewers, or such other means as the circumstances may require.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Storm Drain Pipe Materials:
 - 1. The Contractor shall have the following options for pipe material:
 - a. Class III reinforced concrete, meeting the requirements of ASTM C76 with tongue and groove joints unless indicated otherwise in the drawings.
 - b. Contech A-2000 PVC Pipe.
 - c. ADS N-12 HDPE
 - 2. Use ductile iron where indicated on the drawings.
- B. Factory Fabricated Downspout Boots:
 - 1. **Cast Iron Downspout Boots: contoured interior flow design with no boxed corners, weld seams or choke points; include integral lug slots and stainless steel fasteners.**
 - a. **Downspoutboots.com, a division of J. R. Hoe & Sons; 101 Ironwood Rd., Middlesboro, KY 40965: www.downspoutboots.com.**

- b. **Neenah Enterprises, Inc.; 2121 Brooks Avenue, Neenah, WI 54956; Ph. 920.725.7000; www.groupnei.com.**
 - c. **Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.**
 - 2. **Configuration: Offset/O-Series; Angular/A-Series or Ninety/N-Series as required. Inside top bell shall be sized as required to connect to specified metal downspouts. Length shall be sized as required to connect to drain line run to storm sewer as indicated on the drawings.**
 - 3. **Material: Cast iron; ASTM A48/A48.**
 - 4. **Finish: Manufacturer's standard powder coat finish.**
 - 5. **Color: To be selected by Architect from manufacturer's standard range.**
 - 6. **Accessories:**
 - a. **Manufacturer's standard stainless steel fasteners for mounting onto building wall**
 - b. **Flexible rubber adapter for connection to drainage pipe**
- C. **PVC Downspout Boots:**
- 1. Configuration: Inside top bell shall be sized as required to connect to specified metal downspouts. Length shall be sized as required to connect to drain line run to storm sewer as indicated on the drawings.
 - 2. Material: Polyvinyl Chloride (PVC).
 - 3. Finish: Exposed to be painted.
 - 4. Color: To be selected by Architect.
 - 5. Accessories:
 - a. Stainless steel fasteners for mounting onto building wall.
- D. **Appurtenance Material:**
- 1. Brick:
 - a. Clay or Shale Brick: Comply with ASTM C 32 for Sewer Brick and Manhole Brick, grade as selected.
 - b. Concrete Masonry Units: Comply with ASTM C 139.
 - 2. Mortar: Comply with ASTM C 270, Type M, for pipe joints and man- hole and inlet brickwork.
 - 3. Concrete:
 - a. Concrete for use in precast concrete catch basins, curb inlets, drop inlets and manholes shall be 3000 psi at age 28 days.
 - 4. Reinforcement: Comply with ASTM A 615.
 - 5. Castings: Comply with ASTM A 48, grey cast-iron.
 - 6. Riprap: Riprap shall be Class I conforming to Section 814 of the State of Alabama Highway Department Standard Specifications.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. **Storm Drainage System:** Construct drainage structures and appurtenances in accordance with applicable standard drawings and construction details shown on the Drawings.
- B. **Lay all pipe in an open trench of dimensions as given below:**

1. Lengths of storm drain pipe shown on the Drawings are approximate distances center-to-center of structures. Install pipe based on actual field measurements.

C. Excavation:

1. Excavation is open cut. The top portion of trenches may be excavated as required by the Contractor to any width which will not cause damage to adjacent structures. The lower portion of the trench, to a height of 1 ft. above the top of the pipe shall not exceed 18 in. greater than the pipe dia.
2. All excavation shall be prosecuted in accordance with requirements of OSHA "Safety and Health Regulations for Construction".
3. When sheeting or shoring is used, widths may be increased by the thickness of the timbers. All protective measures required are the responsibility of the Contractor and shall be provided at the Contractor's expense.
4. Carefully shape the bottom of trenches to conform to and support the lower 1/4 of the periphery of the pipe barrel. At the Contractor's option, trenches may be excavated slightly over depth, and then the pipe bed may be constructed of approved granular material, thoroughly tamped and carefully shaped to conform to and support the lower 1/4 of the periphery of the pipe barrel. Where rock is encountered, remove to a depth of 6 in. below the pipe and replace with an approved granular material.
5. Where suitable material, such as muck, is encountered at or below invert elevation during excavation, remove and replace with suitable material, or stabilize by the addition of a granular material.

D. Pipe Laying:

1. Proceed upgrade where practicable. Lay pipe shall true to grade and line with a straight and uniform invert. Do not lay pipe in a wet or muddy trench. Dewater trenches as required with firm, smooth and properly shaped bed as specified.
2. Lay corrugated metal pipe so that if invert paving has been damaged, repair with an asphaltic compound to the satisfaction of the Engineer.
3. Joints for reinforced concrete pipe shall be with sand-cement grout.

E. Backfilling:

1. Backfill with selected material, free from rock larger than 2 in. in size, or debris.
2. Carefully place backfill and tamp around and over the pipe to avoid displacement of the pipe or damage to the joints.
3. Place all backfill in 6 in. lifts and compact as required in EARTHWORK Section. Compaction methods shall be at the Contractor's option as long as the desired results are obtained; otherwise, the Architect may order changes in methods or equipment.

F. Appurtenances and Drainage Structures:

1. Furnish and install drainage structures as shown in detail on the Drawings. Install shaped inverts.
2. Fill all mortar joints full. Tool all joints.
3. Cut and grind all pipe, where cut at face of structure wall, smooth with the face of the wall. Pack full all joints around pipe and structure wall at the face of the wall with mortar.
4. Clean bottom of drainage structures of all debris, and wipe walls clean of mortar as work progresses.
5. Construct catch basin tops true to line and grade, and slope continuous with gutter.

6. Install cast iron steps in all structures over 4 ft. deep, installed 15 in. o.c. in a vertical direction. Cast iron steps and manhole rings and covers shall meet ASTM A 48.
7. Construct junction boxes with bottom as shown in details for drop inlets, catch basins or other structures. Construct tops to accommodate a standard manhole ring, and adjust over to grade.
8. Where indicated in the Storm Structure Schedule, drainage basins by Contech or Nyloplast may be used.

3.2 ADJUSTING AND CLEANING

- A. At completion, remove all excess materials, debris, etc. resultant from operations of this Section of Work.
- B. Leave drainage systems clean and free from mud or debris of any kind. When looked through, each line between structures shall show a full circle of light; otherwise the Contractor shall be required to remove and replace the defective portion of the work, at the Contractor's expense.

END OF SECTION

SECTION 02730 - SANITARY SEWERS

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 work of this section.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.
- B. Sanitary sewer construction is subject to review and acceptance by the Local Sewer Department and shall meet their requirements.

1.3 SITE CONDITIONS

- A. Coordinate sanitary sewer construction with grading operations to avoid deep trench conditions insofar as possible.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe: Type as shown Drawings.
 - 1. PVC Pipe:
 - a. Gravity Pipe – Plastic pipe for gravity sewers, stacks and laterals, and fittings shall be unplasticized polyvinyl chloride (PVC), meeting or exceeding ASTM Specification D3034, latest edition, Classification SDR 35.
 - b. Force Main Pipe – PVC pipe for force mains shall conform to the requirements of ASTM D2241 for pressure pipe or AWWA C900. Pipe shall be Class 150 with a Standard Dimension Ratio of 18 or heavier.
 - c. All sanitary sewer PVC pipe shall be either green or brown in color.
- B. Appurtenances:
 - 1. Manholes: Precast concrete units conforming to ASTM 478.
 - 2. Castings: Grey cast iron conforming to ASTM A 48.
 - 3. Cleanout Cover – Capitol Foundry, Part # VB-9*S, Cleanout Box and Lid, Cast Iron, conforming to ASTM A-48.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Trenching and Excavation:
 - 1. Excavate in open trench to the width, depth and in the direction necessary for the proper construction of the pipe sewer according to the Drawing.
 - 2. Shape the bottom of the trench so as to conform as nearly as possible to the outside of the pipe, particular care being taken to recess the bottom of the trench in such a manner as to relieve the bell of the pipe of all load.
 - 3. Build pipe sewers in a trench, the width of which at the top of the pipe shall not exceed the external dia. of the bell of the pipe, plus 12 in. each side, unless otherwise directed by the Engineer, but in no case less than 24 in. in width.

4. All excavation shall be performed in accordance with requirements of OSHA "Safety and Health Regulations for Construction".

B. Backfilling:

1. The sanitary sewer pipe shall be bedded in a crushed stone bench bottom installed to a minimum depth below the pipe of six (6) inches. After the pipe is installed, the trench shall be backfilled with crushed stone to a depth of one-half the pipe diameter for depths of cut of 12 feet or less. For depths of cut greater than 12 feet the pipe shall be backfilled with crushed stone to a height of 6" above the top of the pipe.
2. No. 12 THW copper locator wire shall be placed in the trench, 12 inches above the sewer mains and all sewer service piping.
3. Backfill all trenches and excavation immediately after the pipes are laid therein unless other protection for the pipe line is directed. The backfilling material shall be selected and deposited with special reference to the future safety of the pipes. Solidly tamp clean earth, sand or rock dust about the pipe up to the level of 6 in. above the top of the pipe, and carefully deposit in uniform layers, each layer solidly tamped or rammed with proper tools so as not to disturb or injure the pipe line. Mechanical means may be permitted for backfilling, provided the equipment meets the approval of the Architect. Faithfully ram or tamp the remainder of the backfilling of the trenches in layers of not more than 6 in. in depth with either approved mechanical or hand tamps. Compaction shall conform to the requirements of the EARTHWORK Section.
4. All backfilling material shall be free from rock, trash and debris.

C. Laying Pipe

1. Lay pipe with joints close and even, butting all around, special care being taken that there is no sagging at the hub, and that a true surface is given to the invert throughout the entire length of the sewer.
2. Water in Trenches: Do not use sewers for draining water from ditch. Provide and operate pumps, if necessary, to remove water from trench while pipe is being laid and joints made.

D. Jointing Pipe:

1. In jointing gasket pipe, clean both the bell and the spigot before the gasket is applied. Use the proper size gasket for each size of pipe, and lubricate only with a lubricant recommended by the manufacturer of the pipe. Insert the spigot end in the bell the proper distance, and take care to see that the pipe remains in this position.
2. Clean all joint material that may be left on the inside, and leave the pipe clean and smooth throughout. At every third pipe, fill around immediately after being properly placed and jointed to prevent the moving of joints.
3. Free the interior of the pipe of all dirt and superfluous material of every description, as the work proceeds.

E. Manholes:

1. Manholes shall be precast concrete conforming to ASTM 478. Shape inverts and build of concrete.

F. Exterior Cleanout Pad and Cover:

1. Contractor to install 18" x 18" x 12" concrete pad flush with grade around cleanouts.
2. Install cleanout cover flush with concrete pad, per manufactures recommendations to prevent damaging cleanout system.

3.2 FIELD QUALITY CONTROL

- A. Testing:** Perform Required Test as required by Local Authority.

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SANITARY SEWERS
02730-2

3.3 ADJUSTING AND CLEANING

- A. Clean and clear sanitary sewers of materials of all kind.

END OF SECTION

SECTION 02810 - SODDING AND TOPSOIL

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 work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sod:
 - 1. Provide strongly rooted **419 Bermuda Sod**
 - 2. Sod shall be not less than 2 years old and free of weeds and undesirable native grasses.
 - 3. Only provide sod capable of growth and development when planted (viable, not dormant).
 - 4. Provide machine cut sod of a uniform minimum soil thickness of 5/8 inch, plus thickness of top growth and thatch. Sod pieces to be consistent in size and shape.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Sodding shall be restricted to those as instructed or recommended by the local Cooperative Extension Agent except when special instructions to the contrary are issued in writing by the Architect.
 - 1. The Contractor shall furnish, in writing to the Architect, those recommendations of the Extension Agent before proceeding with any operations.
 - 2. Grassing also shall comply with State of Alabama Highway Department specifications, latest Edition.
 - 3. Contractor shall water and maintain newly grassed areas until acceptable stand of grass is established and approved by the Architect.
- B. Preparation of Subgrade Soil:
 - 1. The subgrade soil in those areas to be sodded whether shown or not shown on the plans shall be loosened to a minimum depth of 3 inches and graded to remove all ridges and depressions so that it will be, after settlement everywhere parallel to and at the proper level to provide finished grades specified.
 - 2. All stones over 1" in dimension, sticks, rubbish and other extraneous matter shall be removed during this operation.
- C. Topsoil:
 - 1. Contractor shall furnish and spread layer of topsoil over all areas.

Topsoil shall be spread in loose layers to provide finished grades specified and shall have an equal depth of not less than 4" over the site after natural settlement and light rolling.
- D. All areas shall be carefully graded and raked to accurate specified grades and uniform slopes following topsoil spreading. The surface, when finished and settled shall conform to required grades and shall be free from hollows and other inequalities, from stones over 1" in diameter, sticks and other debris, and shall be satisfactory to the Architect.
- E. Initial fertilization of sodded area prior to sodding and following preparation, commercial fertilizer 4-10-10 or 4-12-12 shall be applied on all grass areas at the uniform rate of 20 pounds per 1,000 square feet each.

3.2 SODDING

- A. Prepare all areas to receive sod.
- B. **The Contractor shall fully sod all graded and disturbed areas, including the Contractors staging area and all areas disturbed by vehicular construction traffic, whether shown on plans or not.**

3.3 TOPSOIL

- A. General:
 - 1. Provide topsoil of natural, friable, fertile, fine loamy, soil possessing the characteristics of representative top soils in the vicinity which produces a heavy growth; free from subsoil, weeds, litter, clods, stiff clay, stones, stumps, roots, trash, toxic substances or any other material which may be harmful to plant growth or hinder planting operations.
 - 2. The topsoil shall not be in a muddy or frozen condition. Topsoil shall be that material stripped and stockpiled, or as required to provide 4" of coverage.
 - 3. The topsoil shall have a pH range of 5.9 to 7.0.
 - 4. Limestone or aluminum sulfate (or acceptable substitute) may be used to adjust the pH of the topsoil to an acceptable level.

END OF SECTION

SECTION 02825 – ALUMINUM ORNAMENTAL FENCE SYSTEM

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Ornamental Aluminum Fence System.

1.2 RELATED WORK

- A. Section 03310, Concrete

1.3 SYSTEM DESCRIPTION

- A. The Contractor shall supply and install a total ornamental aluminum fencing system. The system shall include all components (i.e., pickets, posts, rails, gates and hardware) required.

1.4 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials specified.

1.5 REFERENCES

- A. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- C. ASTM D523 - Test Method for Specular Gloss.
- D. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- E. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- F. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- G. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- H. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- I. AAMA 2603 - Voluntary Specification, Performance Requirements & Test Procedures for Pigmented organic Coatings on Aluminum Extrusions and Panels.

1.6 SUBMITTAL

- A. The manufacturer's submittal package shall be submitted prior to installation to confirm compliance with all requirements for materials specified in this section.

1.7 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 – MATERIALS

2.1 MANUFACTURER

- A. Ameristar Perimeter Security USA Inc.; 1555 N. Mingo Road, Tulsa, OK 74116; www.ameristarfence.com; PH: 888.333.3422.
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIAL

- A. "Echelon" Aluminum Ornamental Fencing by Ameristar Perimeter Security USA Inc.
 - 1. Style: "Majestic" 3-rail style.
- B. Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T6.
- C. Pickets shall be 5/8" square x .050" thick. Horizontal rails shall be 1" x 1-1/8" Forerunner™ channel with .055" thick top & internal web wall, and .072" thick side walls and shall be punched to allow picket to pass through the top of the rail. The Forerunner rail shall be constructed with an internal web insert providing a raceway for the pickets to be retained with a 1/8" retaining rod. Fence posts and gate posts shall meet the minimum size requirements of Table 1.
- D. Accessories: Aluminum castings shall be used for all post caps, scrolls, finials, and other miscellaneous hardware. Hinges and latches shall be fabricated from aluminum, stainless steel or composite materials.

2.3 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the ForeRunner rails (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly. Panels to be preassemble by manufacturer.
- B. The manufactured framework shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be Black, Bronze, or White as selected by the architect. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.
- C. Swing gates shall be fabricated using Echelon Forerunner rail material, 1.25" sq. x .125" gate ends, and 5/8" sq. x .050 pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

PART 3 – EXECUTION

3.1 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 FENCE INSTALLATION

- A. Fence post shall be spaced according to Table 3. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels rails shall be inserted into punched posts and affixed with fasteners. Posts shall be set in concrete footers per manufacturers recommended (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The Concrete sections of the project manual shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.3 FENCE INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces:
 - 1. Remove all metal shavings from cut area.

2. Apply custom finish paint matching fence color.
- B. Failure to seal exposed surfaces per steps 1 & 2 above will negate warranty. Ameristar spray cans or paint pens shall be used to finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.4 GATE INSTALLATION

- A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.5 CLEANING

- A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

3.6 TABLES

Table 1 – Minimum Sizes for Echelon Posts	
<u>Echelon Posts</u>	<u>Panel Height</u>
2" x 2" x .060"	Up to 6' Height
<u>Gate Leaf</u>	<u>Gate Height</u>
	<u>Up to & Including 4'</u>
Up to 6'	2" x 2" x .125" Alum.

Table 2 – Coating Performance Requirements		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 1000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822, D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Echelon – Post Spacing (punched posts)	
Span	
Post Size	2"
Post Settings	72" o.c.

*Note: When using swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.

END OF SECTION

SECTION 02846 - SITE GRAPHICS

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 work of this section.

1.2 SECTION INCLUDES

- A. Provide traffic control signs complying with U. S. Department of Transportation, Federal Highway Administration's "Manual on Uniform Traffic Control Devices" and as required by other local ordinances or regulations or other governing authorities and as specified herein. See Drawings for type and quantity of signs required.
- B. Work shall comply with the latest edition of city ordinance and/or regulations and requirements of any governing authority on site graphics.

1.3 SUBMITTALS

- A. Submit manufacturer's mounting instructions to Owner, Architect and Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- A. SA-SO, Inc.; www.sa-so.com; 525 N. Great Southwest Pkwy., Arlington, Texas 76011; Phone: 972.641.4911.
- B. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. SIGNS

- 1. "Handicapped Parking" with Symbol Sign
 - a. 12"x18"
 - b. Blue legend on White reflective background
 - c. ASTM Type II Super Engineer Grade (SEG) sheeting on reflective sign
- 2. "Van Accessible" Supplemental Sign
 - a. 12"x6"
 - b. Blue legend on White reflective background
 - c. ASTM Type II Super Engineer Grade (SEG) sheeting on reflective sign

B. POSTS

- 1. "U" Channel Sign Posts
 - a. Standard Weight: 2 lbs. per foot
 - b. Galvanized
 - c. Pre-drilled and punched on 1" centers entire length for easy sign mounting.
 - d. Meet ASTM A499

2.3 MOUNTING HARDWARE

- A. Provide stainless steel nuts, bolts, and washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Placement of all site signage shall be as directed by the Architect during construction.
- B. Mount signs in accordance with manufacturer's instructions.

END OF SECTION

SECTION 03310 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of concrete work is shown on drawings.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACL 301 "Specifications for Structural Concrete for Buildings".
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete"
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
- B. Concrete Testing Service: The **Owner** will engage and pay a testing laboratory to perform material evaluation tests.
- C. Materials and installed work may require retesting, as directed by Architect, at anytime during progress of work. Provide free access to material stockpiles and facilities. Retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.4 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joints systems, curing compounds, dry-shake finish materials and others as requested by Architect.
- B. Shop Drawings Reinforcements: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement.
- C. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Use plywood complying with U. S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.
- D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed, unless otherwise noted.
- B. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Supports for Reinforcement: Provide supports for reinforcement including 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, unless otherwise acceptable.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs @ 24" on center.
 - 2. For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide support with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 3).

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, unless otherwise acceptable to Architect.
 - 1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Normal Weight Aggregate: ASTM C 33, and as herein specified. Provide aggregate from a single source for all concrete.
 - 1. Do not use fine or coarse aggregates containing spalling-causing deleterious substances.
- C. Water: Drinkable.
- D. Air-Entraining Admixture: ASTM C 260.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Air-Mix, Euclid Chemical Co.
 - b. Sika-Ai", Sika Corp.
 - c. Darex AEA, W. R. Grace
 - d. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- E. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1% chloride ions.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Accelguard 80; Euclid Chemical Company
 - b. Pozzolith High Gally; Master Builders
 - c. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.1% chloride ions.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Edoco 20006; Edoco Technical Products
 - b. Pozzolith 300-R; Master Builders

- c. Eucon Retarder 75; Euclid Chemical Company
 - d. Daratard; W. R. Grace
 - e. Plastiment; Sika Chemical Company
 - f. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- G. Certification: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.
- H. Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

2.4 RELATED MATERIALS

- A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:
- 1. Polyethylene sheet not less than 10 mils thick.
- B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
- 1. Waterproof paper
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.
- D. Liquid Membrane Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type 1-D, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal. Equal to "Kure-N-Seal" - 30; Sonneborn-Contech
- 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Master Builders
 - b. Euclid Chemical Company
 - c. A.C. Horn
 - d. The Burke Company
 - e. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- E. Bonding Compound: Polyvinyl acetate or acrylic base, re-wettable type.
- 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Welcrete; Larsen Products
 - b. EucoWeld; Euclid Chemical Company
 - c. Hornweld; A. C. Horn
 - d. Sonocrete; Sonneborn-Contech
 - e. Acrylic Bondcrete; The Burke Company
 - f. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

- F. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
1. MANUFACTURERS: The following manufacturers' products have been used establish minimum standards for materials, workmanship and function:
- Epoxite; A. C. Horn
 - Sikadur Hi-Mod; Sika Chemical Corporation
 - Euco Epoxy 463 or 615; Euclid Chemical Company
 - Patch and Bond Epoxy; The Burke Company
 - Sure-Poxy; Kaufman Products, Inc.
 - Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- G. Subfloor Patching and Leveling: The following manufacturers' products have been used establish minimum standards for materials, workmanship and function:
1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
- Ardex K-15; Ardex Engineered Cements 400 Ardex Park Drive Aliquippa, PA 15001; (724) 203-5000
 - Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

PART 3 - EXECUTION

3.1 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete as indicated on drawings and schedules.
- D. 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; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- E. Admixtures:
- Use water-reducing admixture in all concrete for ease of placement and workability.
 - Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
 - Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 6% with a tolerance of plus-or-minus 1-1/2%.
- F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
- Ramps, slabs and sloping surfaces: 3" to 5".

2. Reinforced foundation systems: 2" to 5".
3. Other concrete: 3" to 5".

3.2 CONCRETE MIXES

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
 2. When air temperature is between 85 degrees F and 90 degrees, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

3.3 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- 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, off-sets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- 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. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like, to prevent swelling and for easy removal.
- 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 time to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Form Ties: Factory-fabricated, adjustable-length, removable, or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
 1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- H. 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. Accurately place and securely support items built into forms.
- I. 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. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.4 PLACING REINFORCEMENT

- A. 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.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

- C. Accurately position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. 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 end laps in adjacent 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, as acceptable to Architect.
 - 1. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.
- B. 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, and elsewhere as indicated.
 - 1. Joint filler and sealant materials are specified in Division-7 sections of these specifications.
- C. Construction Joints in Slabs-On-Ground: Construct construction joints in slabs-on-ground to form panels of patterns no larger than 225 (15x15) square feet and as shown and as detailed. An alternative control joint detail may be inserts 1/4" wide x 1' minimum on 4" of slab depth.
 - 1. Saw cutting control joints must be done as soon as the troweling machine comes off the slab.
 - 2. Joint sealant material is specified in Division-7 sections of these specifications.

3.6 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.
 - 1. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.7 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 a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. 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.

3.8 CONCRETE PLACEMENT

- A. Replacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified.
 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which 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 as nearly as practicable to its final location to avoid segregation.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" 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.
 1. Consolidate 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 recommended practices.
 2. 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 at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- D. 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.
 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strike-off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position during concrete placement operations.
- E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
 1. When air temperature has fallen to or is expected to fall below 40 degrees F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F. and not more than 80 degrees F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not place concrete when air temperature has fallen to or is expected to fall below 35 °F. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- F. Hot Weather Placing:
 1. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACE 305 and as herein specified.
 2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. 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.
 3. 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.

4. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
5. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.9 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete such as waterproofing, dampproofing. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: For formed concrete surfaces exposed to view provide smooth rubbed finish, 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. 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.

3.10 MONOLITHIC SLAB FINISHES

- A. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for randomly trafficked floor surfaces:
 1. Specified overall values of flatness, F(F) 38: and levelness, F(L) 25: with minimum local values of flatness, F(F) 19: levelness, F(L) 13: for slabs on grade.
- B. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo and other bonded applied cementitious finish flooring material, and as otherwise indicated.
- C. Slope surface uniformly to drains where required. After leveling, roughen surfaces before final set, with stiff brushes, brooms or rakes.
- D. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing membrane or elastic roofing, or sand-bend terrazzo, and as otherwise indicated.
 1. After screeding consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- E. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
 1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth surface defects which would telegraph through applied floor covering system.

- F. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application. **LIGHT BROOM FINISH ONLY.**

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 7 days.
 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
1. Provide moisture curing by one of the following methods or by a combination of the following methods: **Area where Sports Flooring will be installed must be wet cured, no curing compound, see Section 09624.**
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- C. Provide moisture-cover curing as follows:
1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- D. Provide curing and sealing compound to interior slabs with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs as follows:
1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. Do not use membrane curing compounds on surface which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp-proofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to Architect.
- F. Curing Formed Surfaces: Cure formed concrete surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- H. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.
- I. Sealer and Dust-proofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of walls, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided cutting and protection operations are maintained.
- B. Formwork supporting weight of concrete, may not be removed in less than fourteen (14) days and until concrete has attained design minimum compressive strength of in place concrete by testing field-cured specimens representative of concrete location in members.
- C. Form facing material may be removed four (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.

3.13 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.14 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. Reinforced Masonry: Provide concrete grout for reinforced masonry, masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms when acceptable to Architect.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4" 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". 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 after bonding compound has dried.
 - 2. 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.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. 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.
- C. Repair of Unformed Surfaces: 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, in addition to smoothness using a template having required slope.
 1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and exposed reinforcing steel with at least 3/4" clearance all around.
 5. 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.
 6. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. 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. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than seventy-two (72) hours.
 7. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
 8. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Owner will employ and pay for a testing laboratory to perform tests and to submit test reports. The Contractor shall notify testing agency 24 hours in advance of requirements.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
- C. The Owner shall maintain equipment on site to cast cylinders, perform slump and air tests, and field cure specimens. Should the project testing agency be absent from the site, the Contractor will be responsible for performing the field tests below.
- D. Sampling Fresh Concrete: ASTM C 172, except as modified for slump to comply with ASTM C 94.
 1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 2. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above; and each time a set of compression test specimens made.

3. Compression Test Specimen: ASTM C 31; one set of four (4) standard 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 day's pour plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at seven (7) days, two specimen tested at twenty-eight (28) days, and one specimen retained in reserve for later testing if required. Minimum compressive strength of concrete shall be 3,000 psi at 28 days unless otherwise indicated.
1. When frequency of testing will provide less than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
 2. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.
 3. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 4. Test results shall be reported in writing to Architect and Contractor within twenty-four (24) hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at twenty-eight (28) days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other non- destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- G. 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 Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
1. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 039500 - CONCRETE SEALER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exposed concrete slabs where concrete sealer is indicated.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Submit four samples of concrete sealer over concrete, 6 by 6 inches sample.
- C. Manufacturer Certificates: Signed by manufacturers certifying that concrete sealer comply with requirements.
- D. Qualification Data: For Installer.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- F. Warranty: Special warranty specified in this Section.
- G. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer with minimum five years documented experience.

1.4 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing substrate conditions permit sealer to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Ambient temperature is above 40 deg F.
 - 2. Concrete surfaces and mortar have cured for more than 28 days.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree to repair or replace materials that fail to maintain water repellency within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE SEALER

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Products:
 - a. Curecrete Distribution Inc.; Ashford Formula.
 - b. Burke by Edoco; Titan Hard.

A New Community Center at
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City of Troy
Troy, Alabama

039500 - 1

CONCRETE SEALER

LATHAN MCKEE PROJECT NO.
MKA 24-261

- c. ChemMasters; Chemisil Plus.
 - d. Euclid Chemical Company (The); Euco Diamond Hard.
- 2. Flammability: Self extinguishing.
- 3. Finish: Non slip finish. Coefficient of friction: 0.6 wet, 0.8 dry.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of concrete sealer.
 - 1. Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of concrete sealer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of concrete sealer and to instruct Applicator on the product and application method to be used.
- B. Concrete Sealer: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Do not apply to concrete that is less than number of days' old recommended by sealer manufacturer in writing.
 - 2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- C. Apply on horizontal surfaces of indicated interior exposed concrete slabs not receiving other finishes.

3.3 CLEANING

- A. Immediately clean concrete sealer from adjoining surfaces and surfaces soiled or damaged by concrete sealer application as work progresses. Repair damage caused by concrete sealer application. Comply with manufacturer's written cleaning instructions.

END OF SECTION

SECTION 04200 - UNIT MASONRY

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 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. Brick masonry.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.
- B. 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.
- C. 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.
- D. Samples: Submit the following samples:
 - 1. Unit masonry samples for each type of exposed masonry unit required; include in each set the full range of exposed color and texture to be expected in completed work.
 - 2. Include size variation data verifying that actual range of sizes for brick falls within ASTM C652 dimension tolerances for brick where modular dimensioning is indicated. The grade shall be SW and the type HBS.
- E. Field Constructed Mock-Up Panel: Prepare mock-up panel for the following types of masonry. Purpose of mock-up is further verification of selections made for color and finish under sample submittals and establishing standard of quality for aesthetic effects expected in completed work. Build mock-up panel to comply with the following requirements:
 - 1. Locate mock-up panel on site where directed by the Architect.
 - 2. Build mock-up panel of typical exterior masonry wall, approximately 4'-0" long by 4'-0" high, showing all typical components, connections, attachments to building structure and methods of installation.
 - 3. Retain mock-up panel during construction as standard for judging completed masonry work. When directed, demolish mock-up panel and remove from site.

1.4 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. Store masonry units off the ground.
- 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.

1.5 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 24 hours after building masonry walls or columns.
- D. 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.
- E. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- F. Protect sills, ledges and projections from droppings of mortar.
- G. Environmental Protection:
 - 1. Maintain air temperature and materials to a minimum of 40 degrees F and a maximum of 90 degrees F prior to and during masonry work
 - 2. Do not lay masonry units which are wet or frozen.
 - 3. Remove masonry damaged by freezing conditions.
- H. For clay masonry units with initial rates of absorption (suction) which require them to be wetted before laying, comply with the following requirements.
 - 1. For units with surface temperatures above 32°F wet with water heated to above 70°F.
 - 2. For units with surface temperatures below 32°F wet with water heated to above 130°F.

PART 2 - PRODUCTS

2.1 BRICK MADE FROM CLAY OR SHALE

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
- B. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.
- C. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfrosted units with all exposed surfaces finished.
- D. Facing Brick: Submit samples for approval of equals prior to bids. Eased edge brick shall not be allowed.
- E. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. ACME Brick Company, Montgomery, AL
 - 2. Boral Bricks, Phenix City, AL
 - 3. Henry Brick Company, Selma, AL
 - 4. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- F. BRICK ALLOWANCES
 - 1. *Face Brick* shall have a value of **\$600.00 dollars per thousand** (Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses brick of lesser value after Bid Process, Contractor shall issue a deductive Change

Order for the difference.

2. *Accent Brick* shall have a value of **\$600.00 dollars per thousand** (Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses brick of lesser value after Bid Process, Contractor shall issue a deductive Change Order for the difference.

2.2 MORTAR AND GROUT MATERIALS

- A. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 1. Atlas
 2. Citadel
 3. Lone Star
 4. Magnolia
 5. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- B. Masonry Cement: ASTM C 91.
 1. Type S for CMU walls
 2. Type N for Exterior Face and Accent brick – color pigment.
- C. ALLOWANCES:
 1. *Face and Accent Brick* to have a value of **\$26.00 dollars per bag**. (Allowances shall be for material only, based on actual number of bags purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses mortar of lesser value after Bid Process, Contractor shall issue a deductive Change Order for the difference.
- D. Hydrated Lime: ASTM C 207, Type S.
- E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.
- F. Water: Clean and potable.

2.3 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 1. Dur-O-Wall, Inc.
 2. Heckman Building Products, Inc.
 3. Masonry Reinforcing Corp. of America.
 4. National Wire Products Corp.
 5. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- B. 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.
- C. Use individual galvanized steel metal ties installed in horizontal joints to bond wythes together **only** where wood or metal stud backup occurs. Provide ties as shown, but not less than one metal tie for 4 sq. ft. of wall area spaced not to exceed 24" o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 1'-0" of all openings and space not more than 3'-0" apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24" o.c. vertically.

2.4 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet.
 2. Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall metal flashing embedded in masonry from, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 5. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
 6. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
 7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
 8. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
 9. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
 10. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive.
 - c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-dieneterpolymer, complying with ASTM D 4637, 0.040 inch thick.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- D. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship, and function:
1. Vinyl Sheet Flashing: (Thickness: 20 mils)
Vi-Seal Plastic Flashing; Afco Products, Inc.

- a. BFG Vinyl Water Barrier; B.F. Goodrich Co.
- b. Nuflex; Sandell Manufacturing Co., Inc.
- c. Wascosea"; York Manufacturing, Inc.
- d. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. See drawings for locations of all required control joints.**
- B. Non-Metallic Expansion Joint Strips: Pre-molded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35%, of width and thickness indicated.
- C. Premolded 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.
 - 1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506.
- D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.6 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

2.7 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including 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 C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.
 - 1. For Exterior Brick, use Type N mortar, equal to Flamingo, Blue Circle or Lehigh.

PART 3 - EXECUTION

3.1 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. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface 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. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- 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-given 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.

3.2 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. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- C. 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.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Maintain joint width shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- C. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- D. Tool all exposed joints, except where otherwise indicated, slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- E. 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.

3.4 CAVITY WALLS

- A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.
- B. Provide weep holes (Open Head Joints) in exterior wythe of cavity wall located as directed on the drawings, spaced 32" o.c., unless otherwise indicated.

3.5 CAVITY WALL INSULATION

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill all cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.6 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, 1/2" 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. 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.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.

3.8 LINTELS

- A. Install steel lintels where indicated.
- 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 formed-in-place masonry lintels. Temporarily support formed-in-place lintels.
- C. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.9 FLASHING OF MASONRY WORK

- A. General: Provide concealed flashing in masonry work at, or above shelf angles, lintels, ledges and other obstructions to the down-ward 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 1/2" 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 over-lapping deformations not less than 1-1/2" and seal lap with elastic sealant.
- D. Install flashing to comply with manufacturer's instructions.
- E. Provide weep holes (open head joints) in the head joints of the first course of masonry immediately above concealed flashings. Space weep holes 32" o.c., unless otherwise indicated.

3.10 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. Point- 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. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.

4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clean water.
5. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 10 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - a. Detergent
6. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

END OF SECTION

SECTION 04720 - ARCHITECTURAL CAST STONE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural Cast Stone.
- B. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 RELATED SECTIONS

- A. Section 04200 – Unit Masonry.
- B. Section 04220 – Architectural Stone Veneer.
- C. Section 07900 – Joint Sealer.

1.3 REFERENCES

- A. ASTM A 615/A 615M - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- B. ASTM A767/A767M - Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
- C. ASTM C 33 - Concrete Aggregates.
- D. ASTM C 150 - Portland Cement.
- E. ASTM C 173 - Air Content of Freshly Mixed Concrete by the Volume Method
- F. ASTM C 231 - Air Content of Freshly Mixed Concrete by the Pressure Method
- G. ASTM C 260 - Specification for Air Entrained Admixtures for Concrete
- H. ASTM C 270 - Mortar for Unit Masonry.
- I. ASTM C 426 - Linear Drying Shrinkage of Concrete Masonry Units.
- J. ASTM C 494 - Chemical Admixtures for Concrete.
- K. ASTM C 618 - Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
- L. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.
- M. ASTM C 979 - Pigments for Integrally Colored Concrete.
- N. ASTM C 989 - Ground Granulated Blast- Furnace Slag for use in Concrete
- O. ASTM C 1194 - Compressive Strength of Architectural Cast Stone.
- P. ASTM C 1195 - Absorption of Architectural Cast Stone.
- Q. ASTM C 1364 - Architectural Cast Stone.
- R. Cast Stone Institute Technical Manual (Current Edition).

S. ACI 530 "Building Code Requirements for Masonry Structures"

1.4 DEFINITIONS

- A. Cast Stone: An architectural stone unit manufactured to copy fine grain texture and color of natural cut stone used in unit masonry applications. Meets ASTM C 1364 requirements.
 - 1. Dry Cast Concrete Products: Manufactured from zero-slump concrete.
 - a. Vibrant Dry Hand Tamp Casting Method: Vibratory compaction by hand tamp of earth-moist, zero-slump concrete against rigid mold until it is densely compacted.
 - 2. Wet Cast Concrete Products: Manufactured from measurable slump concrete.
 - a. Wet Casting Method: Manufactured from measurable slump concrete and consolidated into a mold.

1.5 SUBMITTALS

- A. Comply with Section 01600 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data.
- C. Shop Drawings: Submit manufacturer's shop drawings, including profiles, cross sections, modular unit lengths, exposed faces, anchors and anchoring method recommendations (if required), and annotation of cast stone types and location.
- D. Samples: Submit pieces of manufacturer's cast stone units that represent general range of texture and color proposed to be furnished for project.
- E. Test Results:
 - 1. Submit manufacturer's test results from architectural cast stone units previously made by manufacturer using materials from same sources proposed for use in project.
- F. Manufacturer's Project References: Submit list of projects similar in scope, including project name and location, name of architect, and type and quantity of architectural stone veneer units installed.
- G. Warranty: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Sufficient plant facilities to provide quality, shapes, quantities, and sizes of architectural stone veneer units required without delaying progress of the Work.
 - 2. Minimum of 10 years experience in producing masonry units or cast stone.
 - 3. Fabricating plant shall be certified by the Cast Stone Institute, National Precast Concrete Association, or equivalent certification program.
 - 4. Manufacturer shall have an internal Quality Assurance Testing Program with certified laboratory technician(s).
 - 5. Custom Cast Stone Series and Architectural Masonry Veneer Series are to be manufactured from a similar mix design to match color and texture.
- B. Mock-Ups: Provide full-size architectural cast stone units for use in construction of mock-ups. Approved mock-ups shall become the standard for appearance and workmanship for project.
 - 1. Mock-ups shall remain as part of the completed Work.
 - 2. Mock-ups shall not remain as part of the completed Work. At Architect's direction, demolish mock-ups and remove debris.

1.7 DELIVERY, STORAGE, AND HANDLING

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ARCHITECTURAL CAST STONE
04720-2

- A. Delivery:
 - 1. Deliver architectural cast stone units secured to shipping pallets and protected from damage and discoloration.
 - 2. Provide itemized shipping list.
- B. Storage:
 - 1. Store architectural cast stone units and installation materials in accordance with manufacturer's instructions.
 - 2. Store architectural cast stone units on pallets with non-staining, waterproof covers.
 - 3. Do not double stack pallets.
 - 4. Ventilate units under covers to prevent condensation.
 - 5. Prevent contact with dirt and splashing.
- C. Handling:
 - 1. Protect architectural cast stone units, including corners and edges, during storage, handling, and installation to prevent chipping, cracking, staining, or other damage.
 - 2. Handle long units at center and both ends simultaneously to prevent cracking.
 - 3. Do not use pry bars or other equipment in a manner that could damage units.

1.8 SCHEDULING

- A. Schedule and coordinate production and delivery of architectural stone veneer units with unit masonry work.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Reading Rock, Inc., 4600 Devitt Drive, Cincinnati, Ohio 45246; Phone: (800) 482-6466 Fax: (513) 874-2361; www.readingrock.com; e-mail: info@readingrock.com
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 ARCHITECTURAL CAST STONE

- A. Architectural Cast Stone: RockCast's Custom Cast Stone Series.
- B. Compliance: ASTM C 1364.
- C. Casting Method: Vibrant dry hand tamp or wet cast as specified and/or required.
- D. Texture: Smooth or otherwise as indicated on the drawings.
- E. Color: To be selected by Architect
- F. Units: As indicated on the drawings.

- G. Profiles: [Sills] [Bullnose] [Watertables] [Wall caps] [Pier caps] [Copings] [Banding] [Medallions] [Keystones] [Quoins] [Lintels] [Jack arches] [Sign panels] [_____]
[As indicated on the drawings].
- H. Test Results:
1. Compressive Strength, ASTM C 1194: Minimum 6,500 psi at 28 days.
 2. Absorption, ASTM C 1195: Maximum 6 percent, by the cold water method, at 28 days.
 3. Linear Shrinkage, ASTM C 426: Less than .065 percent.
 4. Density, ASTM C 140: Greater than 120 pounds per cubic foot.
 5. Freeze-Thaw, ASTM C 666: Less than 5 percent cumulative mass loss after 300 cycles.
 6. Air Content: ASTM C 173 or C 231 for wet cast product shall be 4-8% for units exposed to freeze-thaw environments; air entrainment is not required for VDT products.
- H. Curing: Cure in enclosed chamber at 100 percent relative humidity and minimum 90 degrees F for up to 16 hours and yard cure for a minimum of 3 days.

2.3 ARCHITECTURAL STONE VENEER MATERIALS

- A. Portland Cement: ASTM C 150, Type I or III. White and/or gray as required to match specified color.
- B. Coarse Aggregates: ASTM C 33, except for gradation. Granite, quartz, or limestone.
- C. Fine Aggregates: ASTM C 33, except for gradation. Manufactured or natural sands.
- D. Pigments: ASTM C 979, except do not use carbon black pigments. Inorganic iron oxide pigments.
- E. Admixtures:
1. Water Reducing, Retarding, and Accelerating Admixtures: ASTM C 494.
 2. ASTM C 260 for air-entraining admixtures
 3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 4. ASTM C 618 for mineral admixtures
 5. ASTM C 989 for ground granulated blast-furnace slag
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A 615, deformed steel bars. Epoxy coated or galvanized when covered with less than 1-1/2 inches of material.
1. Galvanized Coating: ASTM A 767.

2.4 TEXTURE AND COLOR

- A. General: Match texture and color of full-size sample on file with Architect.
- B. Texture of Surfaces Exposed to View:
1. Fine-grained texture similar to natural stone.
 2. Approximately equal to approved sample when viewed in direct daylight at 10 feet.
- C. Surface Air Voids:
1. Size: Maximum 1/32 inch.
 2. Density: Less than 3 occurrences per any 1 square inch.
 3. Viewing Conditions: Not obvious under direct daylight at 10 feet.
- D. Finish:
1. Minor chips shall not be obvious under direct daylight at 20 feet, as determined by Architect.

- C. Color Variation:
 - 1. Viewing Conditions: Compare in direct daylight at 20 feet, between units of similar age, subjected to similar weathering conditions.
 - 2. Total Color Difference: ASTM C 1364, 6 units
 - 3. Hue Difference: ASTM C 1364, 2 units

2.5 MORTAR

- A. Mortar: ASTM C 270, Type N As specified in Section 04200.
- B. Mortar Materials: As specified in Section 04200.

2.6 ACCESSORIES

- A. Anchors: Non-corrosive type, sized for conditions. Hot-dip galvanized steel
- B. Sealant: As specified in Section 07900.
- C. Cleaner: Prosoco Sure Klean Custom Masonry Cleaner. * Note: Aggressive cleaners may remove too much of the concrete surface paste making some of the color to appear to be "stripped." Therefore, on darker units a less aggressive cleaner such as Prosoco's Light Duty Cleaner should be used to maintain color.

2.7 FABRICATION

- A. Shapes: As indicated on drawings.
 - 1. Suitable wash on exterior sills, copings, projecting courses, and units with exposed top surfaces.
 - 2. Drips on projecting units, wherever possible.

2.8 TOLERANCES

- A. General: Manufacture architectural cast stone units within tolerances in accordance with Cast Stone Institute Technical Manual, unless otherwise specified.
- B. Cross Section Dimensions: Do not deviate by more than plus or minus 1/8 inch from approved dimensions.
- C. Length of Units: Do not deviate by more than length/360 or plus or minus 1/8 inch, whichever is greater, not to exceed plus or minus 1/4 inch.
- D. Warp, Bow, or Twist: Do not exceed length/360 or plus or minus 1/8 inch, whichever is greater.

2.9 PRODUCTION QUALITY CONTROL

- A. Mix Designs: Test new and existing mix designs for applicable compressive strength and absorption compliance before manufacturing cast stone units.
- B. Plant Production Testing: Test compressive strength and absorption from specimens selected at random from plant production. Tests to be conducted by certified laboratory testing technicians.
 - 1. Custom Cast Stone Units: Test in accordance with ASTM C 1194 and C 1195.

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Troy, Alabama

ARCHITECTURAL CAST STONE
04720-5

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine construction to receive architectural cast stone units. Notify Architect if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.
- B. Examine architectural cast stone units before installation. Do not install unacceptable units.
 - 1. All RockCast products are shipped on a pallet and have one unfinished side. Textured units are to be set with the texture face forward and smooth units are stacked "face up" on the pallet.
 - 2. RockCast's Custom Cast Stone Series units do not have returns or finished ends unless otherwise ordered and noted on the shop drawings.

3.2 INSTALLATION

- A. Install units in conjunction with masonry, as specified in Section 04200.
- B. Pull units from multiple cubes during installation to minimize variation in color and help with natural blending.
- C. Cut units using motor-driven masonry saws. Finished ends should be turned to the visible side and the saw cut turned to the inside of the mortar joint to hide exposed aggregates and saw marks.
- D. Do not use pry bars or other equipment in a manner that could damage units.
- E. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- F. Use Type N mortar (ASTM C 270), unless specified otherwise.
- G. Per ACI 530.1, it is not necessary, nor recommended, to wet the units prior to installation.
- H. Set units in full bed of mortar, unless otherwise indicated on the drawings. It is not necessary to rake joints for later tuckpointing. Standard full mortar application with tooling is all that is necessary.
- I. Fill vertical joints with mortar.
- J. Leave head joints in copings and similar components open for sealant.
- K. Make joints 3/8 inch, unless otherwise indicated on the drawings.
- L. Mortar joints should have a slight concave profile (unless specified otherwise).
- M. Remove excess mortar immediately.
- N. Remove mortar fins and smears before tooling joints.
- O. Cover wainscot for protection and bond separation with plastic, felt paper or other approved products.
- P. Cover freshly installed masonry products as required to assist with the curing process.
- Q. Sealant Joints:
 - 1. As specified in Section 07900.
 - 2. Prime ends of units, insert properly sized backing rod, and install sealant.

3. Provide sealant joints at following locations:
 - a. Copings and cast stone units with exposed tops.
 - b. Joints at relieving angles.
 - c. Control and expansion joints.
 - d. As indicated on the drawings.

3.3 TOLERANCES

A. Installation Tolerances:

1. Variation from Plumb: Do not exceed 1/8 inch in 5 feet or 1/4 inch in 20 feet or more.
2. Variation from Level: Do not exceed 1/8 inch in 5 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch or 1/4 of nominal joint width, whichever is greater.
4. Variation in Plane between Adjacent Surfaces: Do not exceed 1/8-inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 CLEANING

- A. Clean exposed units after mortar is thoroughly set and cured.
- B. Perform test of cleaner on small area of 4' x 4' on each type and color and receive approval by Architect before full cleaning. Let test area dry 4 to 5 days before inspection. Keep test area for future comparison.
- C. Clean units by wetting down the surface first, before using the specified cleaner (as specified in Section 2.7.C). Brush on cleaner, let dwell for 2 to 3 minutes. Reapply cleaner, scrub surface with masonry brush and rinse off thoroughly. Areas with heavy soiling use a wood block or non-metallic scraper.
- D. Apply cleaner to units in accordance with cleaner manufacturer's instructions.
- E. Do **not** use the following to clean units:
 1. Muriatic acid.
 2. Power washing.
 3. Sandblasting.
 4. Harsh cleaning materials or methods that would damage or discolor surfaces.

3.5 REPAIR

- A. Repair methods and results to be approved by Architect.

3.6 INSPECTION AND ACCEPTANCE

- A. Inspect completed installation in accordance with Cast Stone Institute Technical Manual.

3.7 WATER REPELLANT

- A. Sealer: Prosoco Sure Klean Weather Seal Siloxane WB or PD or Hydrozo Enviroseal 7 according to manufacturer's recommendations. Apply water repellant for weatherproofing in accordance with water repellant manufacturer's instructions.
- B. Apply water repellant after installation, cleaning, repair, inspection, and acceptance of units are completed.

3.8 PROTECTION

- A. Protect installed units from splashing, stains, mortar, and other damage.

END OF SECTION

SECTION 05540 - METAL STUDS

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Types of work include:
 - 1. Light-gage metal support system for installation of gypsum and other materials.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where gypsum drywall systems with fire- resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Alabama Metal Industries Corp.
 - 2. Bostick Steel Framing Co.
 - 3. Ceco Corp.
 - 4. Dale Industries, Inc.
 - 5. Marinoware, Inc.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 METAL FRAMING

- A. Fabrication: Fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A446, A570 or A611.
- B. Finish: Provide galvanized finish to metal framing components complying with ASTM A525 for minimum G60 coating.

- C. "C"H-Shape Studs: Provide manufacturer's standard 20 gauge unless otherwise noted on the Structural Drawings, size to be as noted on the drawings. **Studs must possess a 1hr rating for structural support of wall structure.**
- D. Fastenings: Attach components by welding, bolting, or screw fastenings, as standard with manufacturers.

2.3 INSTALLATION

- A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.
 - 1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
 - 2. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
 - 3. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- C. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
 - 1. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
 - 2. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Space framing member 24" o.c., unless noted otherwise on the drawings or by UL Classification.
- B. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
- C. Supplementary Supports:
 - 1. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co.
 - 2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 - 3. Extend supplementary supports to the structural support system.

4. Frame openings to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co. Attach vertical studs at jams directly to frames; install runner track section (for jack studs) at head and secure to jamb studs.
5. Erect thermal insulation vertically. Until gypsum board is installed hold insulation in place with 18-gage tie wire or by an equally acceptable method.

END OF SECTION

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 work of this section.
- B. Work Included: All wood, nails, bolts, screws, framing anchors and other rough hardware, and all other items needed for rough and finished carpentry in this work but not specifically described in other sections of these specifications.
- C. Quality Assurance: In addition to complying with all pertinent codes and regulations, all materials of this section shall comply with pertinent provisions of:
 - 1. Southern Pine Southern Pine Inspection Bureau Plywood 'Softwood Plywood - Construction and Industrial' (Amended June 1969), Product Standard PD 1-66 of U.S. Department of Commerce, Bureau of Standards, and A.P.A.
 - 2. Rough Hardware "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction"
 - 3. Building Paper Federal Specification UU-B-790a, dated February 5, 1968
 - 4. Wood Preservative Standard P-5 of the American Wood Preservers Institute
 - 5. Other Similar and pertinent reference standards for the products needed.
- D. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- E. Qualifications of Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.
- F. Rejection: In the acceptance or rejection of rough carpentry, no allowance will be made for lack of skill on the part of workmen.

1.2 PRODUCT HANDLING

- A. Protection: Store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.
 - 1. Use all means necessary to protect lumber materials before, during and after delivery to the job site, and to protect the installed work and materials of all other trades.
 - 2. Deliver the materials to the job site and store all in a safe area, out of the way of traffic, and shored up off the ground surface.
 - 3. Protect all metal products with adequate weather-proof outer wrappings.
 - 4. Use extreme care in the off-loading of lumber to prevent damage, splitting and breaking of materials.
 - 5. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately stored to prevent its inadvertent use.
 - 6. Do not allow installation of damaged or otherwise non-complying material.
 - 7. Use all means necessary to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 – MATERIALS

2.1 MATERIALS - GENERAL

- A. Grade Stamps:
- B. Framing Lumber: Identify all framing lumber by proper grade stamp.
- C. Plywood: Identify all plywood as to species, grade and glue type by the stamp of the American Plywood Association.
- D. Other: Identify all other materials of this section by the appropriate stamp of the agency listed in the reference standards, or by such other means as are approved in advance by the Architect.
- E. Moisture Content: Moisture content of any material for framing not to exceed 19% for boards 8" in width or less. Boards exceeding 8" in width not to exceed 15% at time of installation. All material used for finish and trim work to be kiln dried material with moisture content not to exceed that allowed by FHA for intended use.

2.2 MATERIALS - WOOD

- A. All materials of this Section, unless specifically otherwise approved in advance by the Architect, shall meet or exceed the following:
 - 1. Plates, Grounds or furring
 - a. Pressure treated #2 KD Southern Yellow Pine in contact w/concrete, masonry or plaster
 - 2. Plywood Roof Decking
 - a. 5/8" – 4' x 8' CDX Grade with exterior glue, install with plyclips.
 - 3. Gypsum Sheathing:
 - a. 5/8" exterior grade fiberglass mat-faced gypsum sheathing
 - i. Georgia Pacific Dens-Glass Fireguard Sheathing: ASTM C1177, Type X.
 - ii. R-Value of 0.67.
 - b. Vapor Barrier:
 - i. The General Contractor shall furnish and install a WR MEADOWS® TW Air Shield Wrap, flexible, 40-mil, self-adhering, over all exterior wall sheathing
 - 4. All Framing Members
 - a. Lodge Pole Spruce #2 KD
 - 5. Wood Preservative
 - a. Ammonical copper arsenite or 5% solution of pentachlorophenol

2.3 MATERIALS – MISCELLANEOUS

- A. All materials of this Section, unless specifically otherwise approved in advance by the Architect, shall meet or exceed the following:
 - 1. Steel Hardware
 - a. ASTM A-7 or A-36 (Use galvanized at exterior locations)
 - 2. Machine Bolts
 - a. ASTM A-307
 - 3. Lag Bolts
 - a. Federal Specifications FF-B-561
 - 4. Nails

- a. Common (Except as noted) Federal Specifications FF-N-1-1 (Use galvanized at exterior locations)
- 5. Flashing
 - a. Nervastral Seal Prof HD-20 except where metal is indicated. Nervastral Seal Prof HD shall be installed on all sills and heads ½" inward from outside face of wall and extended 6" on each side of opening brick veneer construction. The sheeting shall not be allowed to hang free prior to completion of brick work but shall be secured to the siding with nails and discs or furring strips.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Stockpiling: Stockpile all materials sufficiently in advance of need to ensure their availability in a timely manner for this work.
- B. Delivery Schedules: Make as many trips to the job site as are necessary to deliver all materials of this section in a timely manner to ensure orderly progress of the total work.
- C. Compliance: Do not permit materials not complying with the provisions of this section of these specifications to be brought onto or to be stored at the job site; immediately remove from the job site all non-complying materials and replace them with materials meeting the requirements of this section.
- D. Inspection: Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 1. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.
- E. Discrepancies: In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- F. Workmanship: All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the drawings and with all pertinent codes and regulations.
- G. Selection of Lumber Pieces: Carefully select all members; select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.
 - 1. Cut out and discard all defects which render a piece unable to serve its intended functions; lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
- H. Shimming: Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.
- I. Treated Lumber: Use only treated lumber for all wood blocks and nailing grounds, etc. (other than foundation grade redwood) in, or in contact with, concrete.
- J. Treatment: Treat all wood less than two feet above finished grade by spraying with the preservative specified in this section of these specifications, to a minimum distance of six inches from the ends, or otherwise treat as approved in advance by the Architect. Perform all treatment in strict accordance with published recommendations of the manufacturer of the treatment preservative.
- K. General Framing: In addition to all framing operations normal to the fabrication and erection indicated on the drawings, install all backing required for the work of other trades. Set all horizontal or sloped members with crown up. Do not notch, bore, or cut members for pipes ducts conduits, or other reasons except as shown on the drawings or as specifically approved in advance by the Architect.

- L. Bearing: Make all bearings full unless otherwise indicated on the drawings. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support; where framing members slope, cut or notch the ends as required to give uniform bearing surface.
- M. Blocking: Install all blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas.
 - 1. All other locations where openings could afford passage for rodents or flames.
 - 2. Fire-block in the following specific locations:
 - a. In all stud walls at ceiling and floor levels.
 - b. In all stud walls, including furred spaces, so that the maximum dimension of each concealed space is not more than eight feet.
 - c. All other locations where openings could afford passage for rodents or flames.
- N. Stud Walls and Partitions: Make all studs single length, unspliced, and platform framed.
- O. Corners and intersections: Unless otherwise indicated on the drawings, frame all corners and intersections with three or more studs and all required bearing for wall finish.
- P. Alignment: On all framing members to receive a finished wall or ceiling, align the finish subsurface to vary not more than 1/8 inch from the plane of surfaces of adjacent framing and furring members.
- Q. Nailing: Use only common wire nails or spikes except where otherwise specifically noted in the drawings.
 - 1. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike provided, however, that 16 d nails may be used to connect two pieces of the two inch (nominal) thickness.
 - 2. Do all nailing without splitting wood, preboring as required; replace all split members.
- R. Bolting: Drill holes 1/16 inch larger in diameter than the bolts being used; drill straight and true from one side only. Bolt threads must not bear on wood; use washers under head and nut where both bear on wood; use washers under all nuts.
- S. Screws: For lag screws and wood screws, prebore holes same diameter as root of thread; enlarge holes to shank diameter for length of shank.
 - 1. Screw all lag screws and wood screws. Do NOT Drive screws.
- T. Installation of Building Paper: Install the specified building paper over all exterior framing members where indicated to be installed, lapping all joints to prevent penetration of water into the stud spaces, and securely fastening the paper in place in accordance with the manufacturer's published recommendations.
- U. Cleaning Up: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends, and debris.

END OF SECTION

SECTION 06192 - METAL PLATE CONNECTED WOOD TRUSSES

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 SUMMARY

- A. This Section includes the following:
 - 1. Roof Trusses.
 - 2. Truss accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section "Metal Fabrications" for rough hardware anchoring trusses to concrete or masonry structures.
 - 2. Division 6 Section "Rough Carpentry" for roof and floor sheathing of structural-use panels and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

- A. Metal-plate-connected wood trusses include planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and erect metal-plate-connected wood trusses to withstand design loads within limits and under conditions required.
 - 1. Design Loads: As indicated.
 - 2. The truss manufacture shall design the trusses for the sprinkler piping load and to provide adequate support at the connection points.
- B. Engineering Responsibility: Engage a fabricator who uses a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for metal-plate-connected wood trusses.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
 - 1. Product Data for lumber, metal-plate connectors, metal framing connectors, bolts, and fasteners.
- B. Shop Drawings detailing location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber to be used; splice details; type, size, material, finish, design values, and orientation and location of metal connector plates; and bearing details.
 - 1. To the extent truss design considerations are indicated as fabricator's responsibility, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include truss Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product certificates signed by officer of truss fabricating firm certifying that metal-plate-connected wood trusses supplied for Project comply with specified requirements and Shop Drawings.
- D. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and

addresses, names and addresses of architects and owners, and other information specified.

- E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
- F. 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 American Lumber Standards Committee (ALSC) Board of Review.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed wood truss installation similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator's Qualifications: Engage a firm that complies with the following requirements for quality control and is experienced in fabricating metal-plate-connected wood trusses similar to those indicated for this Project and with a record of successful in-service performance:
 - 1. Fabricator participates in a recognized quality-assurance program that involves inspection by SPIB; Timber Products Inspection, Inc.; Truss Plate Institute (TPI); or other independent inspecting and testing agency acceptable to Architect and authorities having jurisdiction.
- C. Comply with applicable requirements and recommendations of the following publications:
 - 1. ANSI/TP1 1, "National Design Standard for Metal-Plate-Connected Wood Truss Construction."
 - 2. TPI HIB "Commentary and Recommendations for Handling Installing & Bracing Metal Plate Connected Wood Trusses."
 - 3. TPI DSB "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
- D. Metal-Plate Connector Manufacturer's Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in ANSI/TPI 1.
- E. Single-Source Responsibility for Connector Plates: Provide metal connector plates from one source and by a single manufacturer.
- F. Wood Structural Design Standard: Comply with applicable requirements of AFPA's "National Design Specification for Wood Construction" and its "Supplement."
- G. Single-Source Engineering Responsibility: Provide trusses engineered by metal-plate connector manufacturer to support superimposed dead and live loads indicated, with design approved and certified by a qualified professional engineer.
- H. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated that have resulted in installing metal-plate-connected wood trusses similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. **NOTE: At the Completion of Truss Erection, the Contractor shall provide a Truss Inspection of the installed trusses and permanent bracing by an Engineer Registered in the State of Alabama. The Engineer's Report shall certify the trusses are Correctly Installed, using specified wood grade and configured to meet the design of the supplier. His signed Seal shall be affixed to the report and submitted to the Architect and Engineer Of Record.**

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses with care and comply with manufacturer's written instructions and TPI recommendations to avoid damage and lateral bending.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

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Troy, Alabama

METAL PLATE CONNECTED WOOD TRUSSES
06192-2

1.8 SEQUENCING AND SCHEDULING

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal Connector Plates:
 - a. Alpine Engineered Products, Inc.
 - b. Computrus, Inc.
 - c. Mitek Industries, Inc.
 - d. Robbins Manufacturing Company.
 - e. Tee-Lok Corporation.
 - f. Truswal Systems Corporation.
 - 2. Metal Framing Anchors:
 - a. Cleveland Steel Specialty Co.
 - b. Harlen Metal Products, Inc.
 - c. Silver Metal Products, Inc.
 - d. Simpson Strong-Tie Company, Inc.
 - e. Southeastern Metals Manufacturing Co., Inc.
 - f. United Steel Products Co.

2.2 DIMENSION LUMBER

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. SPIB - Southern Pine Inspection Bureau.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified, to comply with requirements indicated below:
 - 1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- E. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of the following grade and species:
 - 1. Grade for Chord Members: No. 2.
 - 2. Grade for Web Members: No. 2.
 - 3. Species: Southern pine graded per SPIB rules.

2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates from metal complying with requirements indicated below.
- B. Hot-Dip Galvanized Steel Sheet: Structural-quality steel sheet, zinc coated by hot-dip process

complying with ASTM A 653, G60 coating designation; Grade 33 and not less than 0.0359 inch thick.

- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, structural-(physical) quality steel sheet, zinc coated by electrodeposition; 33,000-psi minimum yield strength, coating class C, and not less than 0.0474 inch thick.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified below for material and manufacture.
 - 1. Where truss members are exposed to weather or to high relative humidities, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of stainless steel, Type 304 or 316.
- B. Nails, Wire, Brads and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts and Screws: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.5 METAL FRAMING ANCHORS

- A. General: Provide metal framing anchors of structural capacity, type, size, metal, and finish indicated that comply with requirements specified, including the following:
- B. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for this Project.
- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304 or 316, chromium nickel steel sheet; 33,000-psi minimum yield strength.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to size, configuration, thickness, and anchorage details required to withstand design loadings for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances of ANSI/TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances of ANSI/TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously into both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install wood trusses until supporting construction is in place and is braced and secured.
- B. Before installing, splice trusses delivered to Project site in more than one piece.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to recommendations of TPI and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space, adjust, and align trusses in location before permanently fastening and as follows:
 - 1. Truss Spacing: As indicated.
- G. Anchor trusses securely at all bearing points using metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances of ANSI/TPI 1.
- K. Do not cut or remove truss members.
- L. Return wood trusses that are damaged or do not meet requirements to fabricator and replace with trusses that do meet requirements.
 - 1. Do not alter trusses in the field.

3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

SECTION 06241 - SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide solid surfacing fabrications including but not limited to following:
 - 1. Surface Tops
- B. Related Sections: Following description of work is included for reference only and shall not be presumed complete:
 - 1. Finish Carpentry - Section 06100.
 - 2. Joint Sealants - Section 07900.

1.2 REFERENCES

- A. Definitions:
 - 1. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Arrange preinstallation meeting 1 week prior to commencing work with all parties associated with trade as designated in Contract Documents or as requested by Architect. Presided over by Contractor, include Architect who may attend, Subcontractor performing work of this trade, Owner's representative, testing company's representative and consultants of applicable discipline. Review Contract Documents for work included under this trade and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of work of this Section.

1.4 SUBMITTALS

- A. Product Data: Indicate Product description including solid surface sheets, sinks, bowls and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. Submit Product data with resistance to list of chemicals.
- B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with section 01600. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.
- C. Coordination Drawings: Submit coordination drawings indicating plumbing and miscellaneous steel work indicating locations of wall rated or non-rated, blocking requirements, locations and recessed wall items and similar items.
- D. Samples: Submit samples in accordance with Section 01 30 00. Submit minimum 6" x 6" samples.
 - 1. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- E. Test and Evaluation Reports: Submit flammability test reports and food preparation zone certifications/listing confirming compliance with NSF/ANSI 51. Refer to www.nsf.org for the latest compliance to NSF/ANSI 51 for Food Zone — all food types.

1.5 CLOSEOUT SUBMITTALS

- A. Operational and Maintenance Data:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

SOLID SURFACE FABRICATIONS
06241-1

1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in Project closeout documents.
2. Provide a commercial care and maintenance kit and video. Review maintenance procedures and warranty details with Owner upon completion.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Provide work of this Section executed by competent installers with minimum 5 years of experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

B. Mock-Ups:

1. Prior to final approval of Shop Drawings, erect 1 full size mock-up of each component at Project site demonstrating quality of materials and execution for Architect review.
2. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from Project site.
3. Approved mock-up will be used as standard for acceptance of subsequent work.
4. Approved mock-ups may remain as part of finished work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

B. Storage and Handling Requirements:

1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.

1.8 WARRANTY

- ### **A. Manufacturer Warranty:** Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer Products of following manufacturers are acceptable subject to Conformance to requirements of Drawings, Schedules and Specifications:

1. Corian® by DuPont; www.corian.com
2. Wilsonart Contract; www.wilsonartcontract.com
3. Formica; www.formica.com

B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. Performance/Design Criteria:

<u>Property</u>	<u>Requirement</u>	<u>Test Procedure</u>
(min or max)		

1. Solid Surface Based Products:

a. Tensile Strength	6000 psi min	ASTM D638
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b. Tensile Modulus	1.5 x 10 ⁶ psi min	ASTM D638
c. Tensile Elongation	0.4% min.	ASTM D638
d. Flexural Strength	10000 psi min	ASTM D790
e. Flexural Modulus	1.2 x 10 ⁶ psi min	ASTM D790
f. Hardness	>85-Rockwell "M" scale min.	ASTM D785
g. Thermal Expansion	2.2 x 10 ⁻⁵ in./in./°F	ASTM E228
h. Fungi and Bacteria	Does not support microbial growth	ASTM G21 & G22
i. Microbial Resistance	Highly resistant to mold growth	UL 2824
j. Ball Impact	No fracture - 1/2 lb. Ball: 6 mm slab - 36" drop 12 mm slab - 144" drop	NEMA LD 3, Method 3.8
k. Weatherability	ΔE*94<5 in 1,000 hrs	ASTM G155
l. Flammability		ASTM E84, NFPA 255 & UL 723

All Colors

	6 mm	12 mm	
m. Flame Spread	<25	<25	
n. Smoke Developed	<25	<25	
o. Class	A	A	NFPA 101®, Life Safety Code

- B. Solid Surface Material: Single Source manufacturer for all solid surfacing fabrications on entire project.
- C. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:
- D. Flammability: Class 1 and A when tested to UL 723.
- E. Food Equipment Material Compliance: Food Zone to NSF/ANSI 51.
 - 1. Ensure material has minimum physical and performance properties specified under "Performance/Design Criteria".
 - 2. Ensure superficial damage to a depth of 0.010" is repairable by sanding and polishing.
- F. Adhesive for Bonding to Other Products: One component silicone to ASTM C920.
- G. Sealant: A standard mildew-resistant, FDA/UL® [and NSF/ANSI 51 compliant in Food Zone area,] recognized silicone color matched sealant or clear silicone sealants.
- H. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.
- I. Heat Reflecting Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- J. Insulating Nomex® Fabric: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.3 COMPONENTS

- A. Counter Perimeter Frame: Ensure 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

SOLID SURFACE FABRICATIONS
06241-3

Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during manufacturing and achieves a maximum flame-spread rating of 25 with a maximum smoke development of 200 when tested to ASTM E84.

- B. Surface Tops: 3/4" thick countertop of solid polymer solid surfacing material, cast to desired profiles and sizes having edge details as indicated on Drawings or from manufactures standards, conforming to CSA B45.5/IAPMO Z124, as specified.
- C. Provide countertops complete with backsplashes and endsplashes of size shown on Drawings. Minimum 4" side and back splashes required at all countertops if not otherwise indicated on drawings. All cutouts required in tops should be coordinated with those trades relevant to necessary cutouts.
- D. Fabrication:
 - 1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
 - 2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.
 - 3. Ensure no blistering, whitening and cracking of components during forming.
 - 4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes for most colors may be fabricated by traditional means discussed in K-25294 Backsplashes. Colors with metallic/mica particle or veined colors creating directional aesthetics (K-26833 Directional Aesthetics) may require the techniques in Technical Bulletin K-28235 Thermoformed Backsplash.
 - 5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.
 - 6. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.
 - 7. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.
 - 8. Finish: Ensure surfaces have uniform finish: As selected by Architect.
 - a. Matte, with a 60° gloss rating of 5 - 20.
 - b. Semi-gloss, with a 60° gloss rating of 25 - 50.
 - c. Polished, with a 60° gloss rating of 55 - 80.
 - 9. Fabrication Tolerances:
 - a. Variation in Component Size: +/-1/8".
 - b. Location of Openings: +/-1/8" from indicated location.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
 3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
 4. Notify Architect in writing of any conditions which would be detrimental to installation.
- B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 INSTALLATION

- A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
- B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.
- C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
- E. Adhere undermount/submount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- F. Adhere topmount sinks/bowls to countertops using manufacturer recommended adhesives and color-coordinated silicone sealant. Secure seam mount bowls and sinks to counter tops using color matched joint adhesive.
- G. Seal between wall and components with joint sealant as specified herein and in Section 0790, as applicable.
- H. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.
- I. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.
- J. Coordinate connections of plumbing fixtures and make plumbing connections to sinks in accordance with Division 15 Mechanical and with any other division requiring cutouts.
- K. Provide holes and cutouts indicated on approved shop drawings. Rout cutouts and complete by sanding all edges smooth.

3.3 REPAIR

- A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.4 SITE QUALITY CONTROL

- A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.5 CLEANING

- A. Remove excess adhesive and sealant from visible surfaces.
- B. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

3.6 PROTECTION

- A. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.
- B. Protect surfaces from damage until date of Substantial Completion of the Work.

END OF SECTION

SECTION 06446 - ARCHITECTURAL COMPOSITE COLUMNS

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. Columns: Load-bearing columns; fiber-reinforced polymer composite; weatherproof, insect-proof, and highly durable.
- B. Decorative Capitals and Bases: To fit over shaft through center of capital and base without affecting height of the column, except for "ornate" styles of capitals for round columns.
- C. Materials for column installation.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each component, including other data as may be required to show compliance with these specifications.
 - 1. Manufacturer's data sheets on each product to be used, including:
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
- B. Installation methods.
- C. Shop Drawings: For all products, show dimensions, configuration, and anchorages.
- D. Selection Samples: Two complete sets of color photographs representing manufacturer's full range of available materials and styles.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.
- C. Handle materials and products to prevent damage to edges, ends or surfaces.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 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.

1.6 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative a copy of the manufacturer's limited warranty outlining its terms and conditions.
- B. Duration: Lifetime limited warranty extended to original owner.
- C. Free from defects in material and workmanship for "lifetime" of ownership. Installation must be per manufacturer's guidelines. "Lifetime" means as long as purchaser of column owns the structure to which column is attached".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. HB&G: P. O. Box 589; Troy, AL 36081; Toll Free Tel: 800-264-4424; Tel: 334-566-5000; Fax: 334-566-4629; Email: info@hbgcompanies.com; Web: www.hbgcolumns.com.
- B. AFCO Industries, Inc., ;3400 Roy Street, Alexandria, LA 71302; Ph. 800.551.6576; www.afcocolumnsandrailings.com.
- C. Melton Classics Inc., 175 Langley Dr Building B3, Lawrenceville, GA 30046; Ph. 800.963.3060; www.meltonclassics.com.
- D. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PERMACAST LOAD BEARING COLUMNS - ROUND TAPERED

- A. PermaCast Column Height:
 - 1. As Indicated on Drawings.
- B. PermaCast Column Size:
 - 1. 6 inches (152 mm) diameter; load limit: 8,000 pounds (3629 kg) per column.
 - 2. 8 inches (203 mm) diameter; load limit: 10,000 pounds (4536 kg) per column.
 - 3. 10 inches (254 mm) diameter; load limit: 14,000 pounds (6350 kg) per column.
 - 4. 12 inches (305 mm) diameter; load limit: 18,000 pounds (8165 kg) per column.
 - 5. 14 inches (356 mm) diameter; load limit: 20,000 pounds (9072 kg) per column.
 - 6. 16 inches (406 mm) diameter; load limit: 20,000 pounds (9072 kg) per column.
 - 7. 18 inches (457 mm) diameter; load limit: 20,000 pounds (9072 kg) per column.
- C. Tapering: One-third, two-thirds entasis.
- D. Texture:
 - 1. Smooth.
 - 2. Fluted.
 - a. Fluted columns are only available for columns sized 8 inches (203 mm), 10 inches (254 mm), or 12 inches (305 mm).
- E. Split Columns:
 - 1. As Indicated or as required.
 - 2. Split columns are NOT load-bearing; they are used for visual continuity or decoration, along a wall and at wall corners. Caps and bases for split columns must be split as well. Split kit provided with each split column, consisting of adhesive, tie straps, fastening plates, and screws.
- F. Capitals and Bases:
 - 1. Capital: Colonial.
 - a. Colonial is also called "economy" and is recommended only when aesthetics are not a priority. It is available for column sizes 6 inches (152 mm) to 12 inches (305 mm).
 - 2. Base: Colonial.
 - a. Colonial is also called "economy" and is recommended only when aesthetics are not a priority. It is available for column sizes 6 inches (152 mm) to 12 inches (305 mm).
 - 3. Split Columns: Provide split capitals and bases to match.

2.3 DECORATIVE COLUMNS – PERMAWRAP PLAIN

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

ARCHITECTURAL COMPOSITE COLUMNS
06446-2

A. PermaWrap Column Height

1. 8 feet (2438 mm). 8-foot (3048 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
2. 10 feet (3048 mm). 10-foot (3048 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
3. 12 feet (3658 mm). 12-foot (3658 mm) columns available in 8 inch (203 mm) to 12 inch (305 mm).

B. PermaWrap Column Size

1. 6 inches (152 mm) square.
2. 8 inches (203 mm) square.
3. 10 inches (254 mm) square.
4. 12 inches (305 mm) square.

C. Panel Thickness:

1. 3/8 inch (10mm) for columns up to 10 feet in height
2. 5/8 inch (15mm) is for 12 foot columns.

D. Assembly Type:

1. Flat Stock.
2. Assembled.
3. "L"-Assembly.

2.4 DECORATIVE COLUMNS – PERMAWRAP TEXTURED

A. PermaWrap Column Height:

1. 6 feet (1829 mm). 6-foot (1829 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
2. 8 feet (2438 mm). 8-foot (3048 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
3. 9 feet (2743 mm). 9-foot (3048 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
4. 10 feet (3048 mm). 10-foot (3048 mm) columns available in 6 inch (152 mm) to 12 inch (305 mm).
5. 12 feet (3658 mm). 12-foot (3658 mm) columns available in 8 inch (203 mm) to 12 inch (305 mm).

B. PermaWrap Column Height:

1. 6 inches (152 mm) square.
2. 8 inches (203 mm) square.
3. 10 inches (254 mm) square.
4. 12 inches (305 mm) square.

C. Panel Thickness: 5/8 inch (15mm).

D. Texture:

1. Fluted.
 - a. Flutes per side: 3.
 - b. Flutes per side: 5.

- c. Flutes per side: 7.
 - d. Flutes per side: 8.
 - 2. Recessed Panel.
 - 3. Raised Panel.
- E. Assembly Type:
- 1. Flat Stock.
 - 2. Assembled.
 - 3. "L"-Assembly.

2.5 ACCESSORY MATERIALS

- A. Construction Adhesive: Non-acetone based exterior grade.
 - 1. Use at top and bottom of shaft.
 - 2. Use at top of cap and bottom of base prior to nailing or screwing to soffit and substrate.
 - 3. If not using square columns with molding, use to affix neck molding to shaft of square columns, prior to screwing or nailing the molding in place.
- B. Caulk: Use to cover holes of nails or screws in molding for square columns.
- C. Molding for Columns:
 - 1. 1/2 inches (12.7 mm) deep by 1 inch (25.4 mm) wide; 8 feet (2438 mm) long panel. (54502)
 - 2. 1/2 inches (12.7 mm) deep by 1 inch (25.4 mm) wide; 10 feet (3048 mm) long panel. (54512)
 - 3. 3/4 inches (19 mm) deep by 1 inch (25.4 mm) wide; 10 feet (3048 mm) long panel. (54504)
 - 4. 1 inch (25.4 mm) deep by 11/16 inches (17.5 mm) wide; 10 feet (3048 mm) long panel. (54503)
 - 5. 3/4 inches (19 mm) deep by 1 5/16 inches (33.3 mm) wide; 10 feet (3048 mm) long panel. (54505)
- D. Hardware:
 - 1. Bottom Anchors: Corner irons.
 - 2. Anchor Fasteners: Deck screws.
 - 3. Anchor Fasteners: Concrete anchors.
 - 4. Anchor Fasteners: Hollow wall anchors.
 - 5. Cap and Base Fasteners: Screws.
 - 6. Cap and Base Fasteners: Nails.
 - 7. Molding Fasteners: Screws.
 - 8. Molding Fasteners: Finishing nails.

2.6 FINISH

- A. Provide smooth finish surface properly sanded and prepared to receive painted finish. Painting shall be as specified in Section 09900, Painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Check opening height before ordering columns.

3.2 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.
- C. If attaching handrails or corner iron to column, pre-drill holes before applying screws.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Plumb and level, with 100 percent of bottom contacting substrate and 75 percent of top contacting soffit. Center load over shaft and evenly distribute around bearing surface.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07200 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections shall apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 - 1. Blanket-type at all exterior stud walls.
 - 2. Sound Attenuation at interior stud walls.
 - 3. Sound Attenuation above acoustical ceilings – at partition walls.
 - 4. Foam Insulation at CMU Cells

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

1.4 PRODUCT HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.1 BATT INSULATION

A. MANUFACTURERS:

- 1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Certain-Teed Products Corp.; Valley Forge, PA
 - b. Manville Bldg. Materials Corp.; Denver, CO.
 - c. Owens-Corning Fiberglass Corp.; Toledo, OH.
- 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

- 1. Mineral/Glass Fiber Blanket/Batt Insulation (M/GFB-Ins): Inorganic (nonasbestos) fibers formed into resilient flexible blankets or semi-rigid batts; FS HH-1-521. Manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated.
- 2. Exterior Walls: Provide foil faced (FSK ASTM 84 – non-flammable) batts at all exterior walls that will have no interior wall covering applied.
 - a. Thickness: 6" Batts will have a minimum R19
- 3. Interior Stud Walls: Provide unfaced Sound Attenuation batts at interior stud partitions.
 - a. Thickness: 3 ½" (nominal), unfaced batts.
- 4. Above New Acoustical Ceilings: Provide unfaced Sound Attenuation batts above all interior metal stud partition-divider walls as indicated on drawings.

- a. Thickness: 3 ½" (nominal), Unfaced batts laid over acoustical ceiling.
- b. Install 4'-0" out from each side of partition/divider wall.
- c. Install entire length of partition/divider wall.

2.2 CAVITY WALL INSULATION - POLYISOCYANURATE

A. MANUFACTURERS:

- 1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Sika Corporation - Rmax; 13524 Welch Road, Dallax, TX 75244; Ph.: 800.527.0890: www.rmax.com.
 - b. Carlisle.
 - c. Johns Manville, Inc.
- 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

- 1. Rigid Foam Insulation Board: Aluminum-Faced, Polyisocyanurate-Foam Insulating Sheathing: ASTM C1289, Type I, Class 1 or Class 2, rigid, cellular, polyisocyanurate thermal insulation, bonded to reinforced aluminum facers on both sides.
 - a. Basis of Design: Thermasheath from Rmax.
 - b. Flame Spread Index and Smoke Contribution per ASTM E84:
 - i. Flame: 25 or less at thickness of 1 inch (25 mm) or greater; and 75 or less at thickness of less than 1 inch (25 mm).
 - ii. Smoke: 450 or less.
 - c. Water Vapor Permeability per ASTM E96 desiccant method: 0.03 perm or less.
 - d. Air Permeability per ASTM E2178: 0.004 cfm per sq ft (1.2192 L per min per sq m) or less.
 - e. Compressive Strength per ASTM D1621:
 - i. 20 psi (138 kPa).
 - ii. 25 psi (172 kPa).
 - f. R-Value per ASTM C518: R-6.0 minimum at thickness of 1 inch (25 mm) and R-13.1 minimum at thickness of 2 inches (51 mm).
 - g. Required Insulation Thickness and R-value: As indicated on the Drawings.
 - h. Insulation shall be suitable as continuous exterior wall insulation.
 - i. Exterior Usage in NFPA 285 Wall Assemblies:
 - j. Acceptable for inclusion in NFPA 285 exterior wall assemblies that include exterior gypsum sheathing.
- 2. All Cavity Walls: Provide rigid thermal insulation at the cavity space.
 - a. 1.10" thick (R-value 6.7), unless otherwise indicated.
- 3. Adhesive:
 - a. Type recommended by insulation board manufacturer for application indicated.

2.3 CMU FILLED CELL WALL INSULATION

A. MANUFACTURERS:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Core-Fill 500, as manufactured by Tailored Chemical Products, Inc., Hickory, NC. Phone: (800) 627-1687: www.core-fill500.com.
 - b. R501, as manufactured by PolyMaster, Inc.", Knoxville, TN. Phone: (800) 580-3626.
 - c. Core Foam Masonry Foam Insulation by cfiFOAM, Inc., Knoxville, TN. Phone: (800) 656-3626.
2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

1. Insulation: Aminoplast foam for injection application.
 - a. Thermal Resistivity: **R/inch equal to R-4.4/inch** @ 75 degrees F mean when tested per either ASTM C-177 or ASTM C518.
 - b. Water Vapor Transmission: Average ≤ 15 perms when tested per ASTM E 96/E96M.
 - c. Potential Heat: ≤ 7700 Btu/lb. when tested per NFPA 259.
 - d. Cured Density: ≤ 1.0 lb/ft³ (dry) when tested per ASTM D 1622.
 - e. Surface Burning Characteristics: Class A - Flame Spread ≤ 25 , Smoke Developed ≤ 450 per ASTM E 84.

C. INSTALLATION:

1. Fill **masonry cells** with foam insulation from exterior face of building.
2. Foam Insulation at exterior concrete block wall **cells**:
 - a. Fill **cells** of concrete masonry with amino-plast foam insulation. Holes for filling cells of masonry shall be drilled at horizontal masonry joint on the exterior side of exposed masonry walls and re-grouted.
 - b. Installed insulation value: **R-10**.
3. Reference Standards:
 - a. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2004.
 - b. ASTM C518 - 01 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2001.
 - c. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2004a.
 - d. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2008.
 - e. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.
 - f. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
 - g. ASTM E 96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
 - h. NFPA 259 - Standard Test Method for Potential Heat of Building Materials
 - i. specified.
 - a. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.

1. Wall Insulation Installation:
 - a. Install thermal break to exterior surface of girts as wall sheathing is applied.
 - b. Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
 - c. Position and secure Fast-R hangers to girts on the inside face of the wall sheathing.
 - d. Cut insulation to required lengths to fit vertically between girts.
 - e. Fluff the insulation to the full-specified thickness.
 - f. Neatly position in place and secure to Fast-R hangers.
 - g. Ensure that cavities are filled completely with insulation.
2. Vapor Barrier Fabric:
 - a. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - b. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
 - c. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
 - d. All seams must be completely sealed and stapled seams not acceptable.
3. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

A. .

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Installer must examine substrates and conditions under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.
- C. Close off openings in cavities to receive poured-in-place and insulation, sufficiently to prevent escape of insulation. Provide bronze or stainless steel screen (inside) where openings must be maintained for drainage or ventilation.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

3.3 CAVITY WALL INSULATION

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face. Fit courses of insulation between wall ties and other confining obstructions

in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill all cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.4 PROTECTION

- A. General: Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION

SECTION 07310
DIMENSIONAL FIBERGLASS ASPHALT SHINGLES

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 DESCRIPTION OF WORK

- A. The work under this section consists of all composition asphalt shingle roofing, underlayment, ridge vent system, sheet metal, roof drainage accessories and all related items necessary to complete the roofing system work indicated on the drawings and herein specified including but not limited to the following:
1. Underlayment.
 2. Dimensional Fiberglass Asphalt Shingle Roofing.
 3. Ridge Vent System.
 4. Roof Vents.
 5. Sheet Metal items furnished and installed in accordance with Section 07600, Flashing and Sheetmetal.

1.3 QUALITY ASSURANCE

- A. The Contractor shall engage the services of a Professional Roof Consultant. The Consultant must hold a minimum title of Registered Roof Observer (RRO) through the International Institute of Building Enclosure Consultants (IIBEC) and provide evidence of adequate insurance as required below. The Consultant should perform three (3) inspections during the installation of each new roof system type (1 – Start up inspection; 2 – Interim inspection; 3 – Final inspection). The Consultant must document all site visits with photographs and written reports. All reports shall be forwarded to the Architect with documentation of the roofing progress and any deficiencies noted during the inspections. ***(Note: Although the contractor will be paying the roof consultant from their proceeds, the roof consultant will be considered an agent of the owner and architect throughout the project and will perform the required inspections on behalf of the owner and architect. The above specification shall be applied to individual facilities when multiple site locations are included in the project.)***

1. Roof Consultant Insurance Requirements:
 - a. Gen. Liability - \$1,000,000 each occurrence - \$2,000,000 General Aggregate / Auto. Liability - \$1,000,000 / Umbrella Liability. - \$1,000,000 / Workers Compensation - \$1,000,000 per statute / Professional Liability - \$1,000,000
2. Approved Roof Consulting Firm:
 - a. Roof Asset Management, Inc.
David Lee, RRO, CIT, FAA-107
Millbrook, AL / (334) 590-7999 / dlee@roof-asset.com
 - b. Substitutions: Roof consulting firms must be pre-approved by the Architect. Requests for a substituting firm must be submitted "In writing" 10 (Ten) days prior to the bid opening.

- B. Manufacturer Qualifications: Company specializing in Asphalt Roofing Products with fifteen (15) years minimum experience. Provide primary roofing material products from a single source including composition asphalt shingles, preformed ridge & hip cap shingles, starter strip and underlayments all produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified. Being listed as pre-qualified manufacturer does not release manufacturer from providing complete, current, and acceptable test data for each performance, thermal, and wind load requirement specified.
- C. Installer's Qualifications: Installer / sub-contractor must be currently in the primary business of roofing with not less than (5) five consecutive years of recorded successful experience with roofing systems comparable to that of this project under the same company name. Installer shall be licensed or otherwise authorized by state and local authorities to install all products specified in this section. **Installer shall be certified by the roofing material manufacturer as trained and approved for installation of such roofing materials indicated for this project.** Installer shall perform work in accordance with NRCA Roofing and Waterproofing Manual. Joint ventures shall not be allowed.
- D. A full-time field supervisor or foreman with minimum of (5) years of experience in a roofing supervisory role, having performed on projects of comparable scope and type shall be required to be on site at all times during roofing work. Any roofing installed during times when the supervisor/foreman is not on site is subject to rejection.
- E. The Roofing Contractor shall be responsible for weather-tightness of the entire roofing system.
- F. The Roofing Contractor shall inspect and accept condition of the roof deck and components of mechanical penetrations prior to installation of the roofing system.

1.4 ASSEMBLY REFERENCE STANDARDS

- A. Underwriters Laboratories Fire Test of Roof Deck Construction Standard 1256.
- B. Underwriters Laboratories Test for Wind Uplift resistance of Roof Deck
- C. Assemblies Standard 580.
- D. ASTM D 3161 Class F Wind Resistance
- E. ASTM D 7158, Class H Wind Resistance.
- F. ASTM D 3462 – Standard Specification for Asphalt Shingle Made from Glass Felt and Surfaced with Mineral Granules.
- G. ASTM D 3018 – Standard Specification for Class A Shingles Surfaced with Mineral Granules.
- H. ASTM E108 Fire Resistance: Class A
- I. UL 790 Fire Resistance: Class A
- J. Roof Deck Manufacturers Design Manual.
- K. NRCA – “The NCRA Roofing and Waterproofing Manual”
- L. Impact Resistance: Roof coverings installed on low-slope roofs (roof slope <2:12) shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746

1.5 ROOFING PERFORMANCE REQUIREMENTS

- A. The roof deck assembly shall exhibit the following performance characteristics:
 - 1. Wind Uplift Rating - FM 1-135 (or per local codes whichever is greater.)
 - 2. Factory Mutual Classifications - FM Class 1
 - 3. Fastener Withdrawal Strength - 40 lbs. min. (or per local codes whichever is greater.)

- B. Composition Asphalt Shingles shall be self-sealing and provided resistant to wind damage as tested up to **130 MPH** winds.
- C. Certification of Roofing System: Contractor(s), Roofing Material Manufacturer, and Roofing Material Manufacturer's Field Inspector shall provide a final inspection to verify proper installation and execute the Certification of Roofing System.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's warranty, technical product data, test reports, maintenance data, installation instructions and recommendations for each type of roofing product required. Include highlighted data substantiating that materials comply with requirements. Include similar color charts of trim and accessories involving color selection.
- B. Submit a sample panel to match existing adjacent shingles for approval (If required).
- C. Installer's Qualification Data
- D. Sample Warranty

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and storage of material: Store and handle roof materials in a manner which will ensure that there is no possibility of significant moisture pick up. Store in a dry, well ventilated, weather tight place. Unless protected from weather or other moisture sources, do not leave unused roofing materials on the roof surface overnight or when roofing work is not in progress. Store rolls of materials and other materials on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck. All material must be protected from the weather by protective tarps. Manufacturer's plastic covers are not acceptable means of protection.
- B. Scheduling and coordinating work: Schedule and coordinate roofing and sheet metal installations with the work of other trades where it is integral or contiguous therewith. Materials furnished under this section, which are to be built-in by other trades, shall be delivered to the site in sufficient time to avoid delays to construction progress. Instruct other trades concerning the location and placement of reglets, wood nailers and cleats.
- C. Proper surfaces: Surfaces to which roofing, and sheet metal are to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from projection nail heads or other defects that would affect the application. Report in writing any unsatisfactory surfaces to the Architect in advance of roofing work.
- D. Dis-similar metals: Where dis-similar metals abut, the juncture shall be executed in a manner that will facilitate drainage and thus minimize the possibility of galvanic action.
- E. Accessories: All accessories or other items essential to the completeness of the sheet metal installation shall be provided as required. All such items, unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to which applied, and the gauges shall conform to recognized industry standards of sheet metal practice.
- F. Solvent-based materials: Store and dispose of solvent-based materials and materials used with solvent based materials, in accordance with requirements of local authorities having jurisdiction.
- G. Extra Material: Furnish to owner
 - 1. Provide 400 square feet (4 square) of extra shingles of each color specified.

1.8 PROJECT CONDITIONS

- A. Substrate: Proceed with shingle work only after substrate construction and penetrating work have been completed.

- B. Weather Conditions: Proceed with shingle work only when weather conditions are in compliance with manufacturer's recommendations and when substrate is completely dry.

1.9 ROOFING GUARANTEE

A. Contractor's Roofing Guarantee

1. All work included in this section shall be jointly and unconditionally guaranteed by the General Contractor and the Contractor for this section, against leaks from faulty or defective materials and workmanship for a period of Five (5) Years starting on the date of acceptance of the project by the Owner.
2. Contractor shall furnish Contractors 5 Year Roofing Guarantee. This roofing guarantee is included in the front-end documentation of this project manual.
 - a. The roofing guarantee shall be executed in three (3) original copies, signed by the appropriate parties, and submitted to the Architect, Owner, and the appropriate County / City Departments if required.
3. Warranty shall include the following: The General Contractor and Roofing Installer shall be responsible for all water damaged materials due to roof leaks for a period of 5 years.

B. Manufacturer's Warranty

1. Manufacturer's roofing warranties which contain language regarding the governing of the warranty by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such warranties.
2. The Contractor shall provide to the Roofing manufacturer's fully executed shingle warranty on shingle materials.
 - a. Material Warranty Period: Forty (40) years from Date of Substantial Completion. Failures include, but are not limited to, the following:
 - i. Manufacturing defects.
 - ii. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
 - b. Non-prorated (Labor & Material) Warranty Period: 20 Year Non-Prorated Warranty Period covering material and labor costs for repair or replacement.
 - c. Algae Discoloration Warranty Period: Asphalt shingles will not discolor ten (10) years from Date of Substantial Completion.
 - d. Wind Warranty: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 130 MPH for Fifteen (15) years from Date of Substantial Completion.
3. Insulated Decks and Radiant Barriers
 - a. Manufacturer's warranty, including non-prorated period, will remain in force when shingles are applied to roof deck assemblies where foam insulation is prefabricated into the roof deck system, where insulation is installed beneath an acceptable roof deck system, or where radiant barriers are installed, with or without ventilation, directly below the deck.
4. The roofing manufacturer shall be required to provide documentation certifying the roofing system and products specified comply with the performance requirements as set forth in IBC Chapter 15, Section 1504. The documentation shall be attached to the roof warranty at the close out of the project.

- C. All roof warranties/guarantees shall be provided to the Owner, by the Contractor at the Final Inspection to obtain the Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship, and function:

1. GAF “Timberline High Definition HDZ Series”.
2. Tamko “Titan XT”
3. CertainTeed “Landmark Pro Series”.

2.2 MATERIALS

- A. Glass-Fiber Reinforced Dimensional/Architectural Asphalt Shingles: Conforming to ASTM D 3161, ASTM D 7158, UL2390, ASTM E108, UL 790, UL Certified to meet ASTM D 3462, ASTM D 3018; glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; four-tab shingle with each tab independently colored by granules no bleed over of granules from previous tab.
1. Color: As selected by Architect after bid date from manufacturer's standard selection.
 2. Shingle System to be complete with manufacturer's underlayment, starter shingles and hip and ridge shingles.
 3. Limitations: Use on roofs with slopes greater than 2:12 pitch. Low slope applications (2:12 to 4:12 pitch) require additional underlayment. Follow manufacturer's instructions for waterproofing in these areas per applications instructions (2 layers – 1/2 lapped application). On slopes less than 2:12 pitch apply 1 inch diameter spots of asphalt roofing cement (ASTM D 4586 Type II) under the shingle tab corner according to application instructions.
- B. Underlayment:
1. Ice and Water Shield: Self-adhering waterproofing membrane underlayment: ASTM D 1970; minimum of 60-mil- thick sheet; glass-fiber-reinforced; SBS-modified asphalt; mineral-granule surfaced.
 - a. Provide at all valleys, ridges, penetrations, curbs, hips, roof edges, below copings, etc.
 2. Synthetic Underlayment/Felt: Polyolefin based scrim reinforced roofing underlayment: ASTM D4869; ASTM D 226; Fire resistance ASTM E 108, UL 790 Fire Resistant. UL classified as a Prepared Roofing Accessory.
 - a. Provide at all open field roof areas. (See slope limitations for additional application requirements.)
- C. Starter Shingles:
1. Starter Shingles: Primary shingle manufacturer's starter shingle: Starter must extend beyond primary field shingle nail penetration line. (Shall be located at the eaves and rakes or any other location where shingle roof begins. The nails should be positioned as near to the eave's edge as possible (max 3”) while avoiding sealant.)
- D. Hip/ Ridge Shingles:
1. Hip and Ridge Shingles: Primary shingle manufacturer's pre-cut hip and ridge shingles applicable for wind warranty rating required under this Specification Section: ASTM 3018; ASTM 3462; ASTM E108, ASTM 3161
- E. Ridge Vent:
1. Rigid Ridge Vent: High-density polypropylene resin or other UV-stabilized plastic ridge vent: External wind deflector baffles; 18 sq. in. of net free area per linear foot; ASTM G155

- F. Intake Vents: (If required) - Attic roof vent that is an on-the-rooftop, intake ventilation product that lets fresh air in to balance ridge vents. Low profile to blend in with roof. Must have end caps/plugs for weather protection and finished appearance.
1. IN-VENT by Cor-A-Vent.
 2. Smart Vent by DCI attic Intake SV-TAP.
 3. Filtered Edge Vent by CertainTeed.
 4. Color to be selected by architect from manufacturer standards.
 5. Must be strictly installed according to manufacturer requirements.
- G. Gravity Vents:
1. High-Capacity Dome Roof Louver Style Gravity Vents; 144 square inches NFVA each; Galvanized Steel construction.
 2. Slant Roof Louver Style Gravity Vents; 50 square inches NFVA each; Heavy duty Galvanized construction.
 3. Finish: Site Painted with Shingle Color match system paint of shingle manufacturer.
- H. Fasteners:
1. Hot dip galvanized, sharp pointed, conventional ring-shank roof nails, 11 to 12 gauge, with minimum of 3/8" diameter flat heads, minimum of 1-1/2" length or of sufficient length to penetrate at least 3/4" into / beyond wood decking shall be used as required. Pneumatically driven fasteners, nails, or staples will not be allowed to be used on this project.
 2. Dry-in underlayment shall be fastened with large 1" head plastic cap nails.
 3. Fasteners for metal flashing materials shall be heavy galvanized. Exposed fasteners for sheet metal flashings shall be screw-type with weather seal washers. Prefinished to match.
- I. Asphalt Roofing Cement:
1. Roof cement shall be asbestos free non-hardening, elastic waterproof type ASTM 4586, Type II; Consistency as required by roofing material manufacturer for application.
 2. All other required materials necessary for a complete job as recommended by the roofing manufacturer or as required by good practice.

2.3 MISCELLANEOUS SHEET METAL WORK

- A. Work under this section includes all other incidental sheet metal items shown on drawings as accessories, trims, and flashings to the composition asphalt roof shingles that may not be specifically included in other sections of the specifications and/or work.
1. Install metal flashing in accordance with The NRCA Roofing and Waterproofing Manual per NRCA including but not limited to:
 - a. Step Flashing
 - b. Cricket Flashing
 - c. Rake and Eave Drip Edge Flashing
 - d. Apron Flashing
 - e. Pipe and Post Flashing
 - f. Lead Vent Pipe Flashing
- B. Refer to Section 07600, Flashing and Sheetmetal, for additional information.

C. Miscellaneous Items

1. Install and flash all items furnished and set by others as specified, in accordance with good practice, properly flashed and bonded weathertight into roofing.

PART 3 - EXECUTION

3.1 PRE-ROOFING CONFERENCE

- A. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect. Required attendees include representatives of the Owner, Department of Construction Management Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), Roofing Materials Manufacturer (if warranty is required of this manufacturer) and all installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment. ATTENDANCE OF THE CONTRACTOR'S FOREMAN IS MANDATORY. If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.
- B. The pre-roofing conference is intended to clarify demolition and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.
- C. The following are to be accomplished during the conference:
 1. To review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
 2. To establish trade-related job schedules, including the installation of roof mounted mechanical equipment.
 3. To establish roofing schedule and work methods that will prevent roof damage.
 4. Require that all roof penetrations and walls be in place prior to installing the roof.
 5. To establish those areas on the job site that will be designated as work and storage areas for roofing operations.
 6. To establish weather and working temperature conditions to which all parties must agree.
 7. To establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.
 8. Tour representative areas of roofing substrates (decks); inspect and discuss condition of substrate, penetrations and other preparatory work performed by other trades.
 9. Review structural loading limitations of deck and inspect deck for proper installation and fastening as required. Inspect deck for required slope etc.
 10. Review roofing system requirements (drawings, specifications, and other contract documents). Review required submittals / warranty issues. Verify that the manufacturer's label contains references to specified ASTM standards.
 11. Review and finalize construction schedule related to roofing work and verify availability of materials.
 12. Review roof application procedures, technique, details, and roof specifics. Maintain one copy of manufacturer's application instructions on the project site.
 13. Review job specific safety requirements, safety barriers, street blocking, haul routes, building access, site contact, facilities, security, etc.

- D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor and the Owner.

3.2 PREPARATION OF SUBSTRATE

- A. Clean substrate of any projections and substances detrimental to shingling work.
- B. Coordinate installation of shingles with flashing and other adjoining work to ensure proper sequencing.

3.3 INSTALLATION – GENERAL

- A. General: Comply with instructions and recommendations of shingle manufacturer in relationship to low slop roof application, except to extent more stringent requirements are indicated.
- B. Installer of shingles must examine substrate and conditions under which shingling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with shingling work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.4 APPLICATION OF UNDERLAYMENT AND ROOFING SHINGLES

- A. (Note: For roof replacement projects, the contractor shall remove the existing shingles, underlayment, and associated flashing components down to the existing deck substrate prior to the application of new underlayment and shingles. Contractor is to notify the Architect of any damaged / deteriorated roof decking. If directed by the Architect, the contractor shall replace damaged portions of the decking per the Unit Price on the proposal form.)
- B. Underlayment Application:
 - 1. Synthetic Underlayment:
 - a. Apply synthetic underlayment horizontally, free of wrinkles, over entire roof deck surface, lapping succeeding courses per the manufacturer's requirements to shed water, and lapping ends min. 4" with adjacent end laps staggered 60". Provide 18" each side of hips. Fasten 36" max. o.c. or as necessary to assure stable placement of felt underlayment until the shingles are installed. Fasten with approved simplex nails (no staples).
 - b. Install felt starter courses as per low slope application requirements lapped and cemented as indicated by the manufacturer.
 - 2. Self-Adhered Underlayment:
 - a. Install at all Valleys, Ridges, Hips and Eaves, Penetrations, Curbs, Rakes, Changes in Elevation, and Miscellaneous Roof Edges.
 - b. Install underlayment centered to the center of the valley. Extend minimum of 18" in each direction from middle of all valleys.
 - c. Install from the edge of all eaves and rakes a total distance of 36".
 - d. Install on all ridges and hips a minimum of 18" in each direction from middle of ridge / hip line.
 - e. Install 18" wide strip each side of expansion joint flange.

C. Shingle Application:

1. Install Composition Asphalt Shingles system, including but not limited to shingles, pre-formed ridge, and hip shingles in accordance with manufacturer's printed instructions and in accordance with The NRCA Roofing and Waterproofing Manual per NRCA.
 2. Install all shingles with uniform exposure as specified by the manufacturer.
 3. Install manufactured starter strips, pre-formed ridge, and hip shingles in strict accordance with manufacturer's printed requirements.
 - a. Provide starter strip at lowest roof edge and along rake edges.
 - b. Shingles shall extend $\frac{3}{4}$ " beyond roof edge flashing.
 - c. Fasten ridge shingle with nail of length sufficient to fully penetrate roof decking.
 4. Install base and wall cap flashings (where roofing meets masonry walls) in strict accordance with the roofing manufacturer's printed specifications.
 5. Provide closed cut valleys per manufacturer's printed instructions; initial layer to lap the valley without fasteners in the valley and upper layer to be cut back two inches parallel to valley center.
 6. Fasten shingles in locations as indicated by the shingle manufacturer's printed instruction according to roof slope and wind load requirements with no less than six (6) nails installed in each shingle regardless of manufacturer's approvals.
 7. The application of the shingles will be by hand nailing ONLY. Pneumatic nail guns will NOT be permitted for installation of shingles.
 8. "Racking" of the shingles will not be permitted.
 9. Staples will NOT be permitted.
 10. Lap cap shingles in direction away from prevailing winds.
- D. Install vent pipe in strict accordance with the manufacturer's instruction for application.
- E. Properly flash all other penetrations in accordance with the roofing manufacturer's printed instructions.
- F. Upon completion of application all shingles shall be properly nailed, with even /uniform exposure, and straight lines and free of loose, crooked, or buckled shingles. Entire installation shall be watertight and properly bonded to flashing.

END OF SECTION

SECTION 07600 - FLASHING AND SHEET METAL

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.
- B. Types of work specified in this section include the following:
 - 1. Metal Counter Flashing and Base Flashing.
 - 2. Metal Diverters. Verify location with Architect for all entry doors.
 - 3. Exposed Metal Trim Units
 - 4. Eave Strip/Drip Edge
 - 5. Fascia
 - 6. Coping
 - 7. Scuppers and Leader Heads
 - 8. Gutters
 - 9. Downspouts
 - 10. Elastic flashing.
 - 11. Elastic roof/wall expansion joint systems.
- C. Integral masonry flashings are specified as masonry work in sections of Division 4.

1.3 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007, with Editorial Revision (2012).
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 SUBMITTALS

- A. Product Data; Flashing, Sheet Metal, Accessories: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

1.5 JOB CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- B. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.2 GUTTERS

- A. Gutters: Provide flat shapes, no rolled formed stiffeners or ribbed allowed. Form gutters in "continuous" sections not less than 8 feet in length, complete with end pieces, outlet tubes and other special pieces as may be required. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs.
 - 1. Furnish gutter supports spaced at 36" on center constructed of same metal as gutters.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- C. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.3 DOWNSPOUTS

- A. Downspouts: Form downspouts in sections approximately 10 feet long (**no corrugated sections**), complete with elbows and offsets. Join sections with not less than 1-1/2" telescoping joints. Provide fasteners, designed to securely hold downspouts not less than 1" away from walls; locate fasteners at top and bottom and equally spaced at approximately 5 feet on center in between.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- C. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.4 SHEET FLASHING

- A. Provide EPDM synthetic rubber sheet except where metal is indicated.
- B. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Nervastral Seal Pruf HD-20

2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

C. Materials:

1. Elastic Sheet Flashing/Membrane: Manufacturer's standard flexible, elastic, black, nonreinforced, flashing sheet of 50 - 65 mils thickness.

2.5 MISCELLANEOUS MATERIALS & ACCESSORIES

A. Solder:

1. For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.
2. 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.

B. Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

C. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

E. Epoxy Seam Sealer: 2-part noncrossive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/ weather-resistant seaming and adhesive application of flashing sheet.

G. Paper Slip Sheet: 5-lb. rosin-sized building paper.

H. Polyethylene Underlayment: 6-mil carbonated polyethylene film; FS L-P-512.

I. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncrossive.

J. 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, noncrossive, size and gage required for performance.

K. Roofing Cement: Must be compatible with materials with which it comes in contact.

L. Provide precast concrete splashblock sloped away from building, approximately 12-inches wide x 24-inches long x 2-inches thick x 3-inches high, with 3-raised edges and one "open" end turned toward building – at locations where downspouts would otherwise drain on grade or paving.

1. Provide 1-preformed metal pan with corrugated bottom and properly hemmed edges (minimum 12" x 24") at each downspout which drains onto a roof below.

2.9 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be

used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 2" deep, filled with mastic sealant (concealed within joints).

- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Underlayment: Where aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division-3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division-4 sections.
 - 1. Install counter-flashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure. No reglets shall be cut.

3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION

SECTION 07900 - JOINT SEALERS

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 DESCRIPTION OF WORK

- A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.
- B. The applications for joint sealers as work of this section include the following:
 - 1. Joints (Interior).
 - 2. Joints (Exterior).
 - 3. Flashing Joints.
 - 4. Interior wall/ceiling joints.
- C. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product required.

1.4 JOB CONDITIONS

- A. Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature by manufacturer for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General: Manufacturers listed in this article include those known to produce the indicated category of prime joint sealant material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.
- B. Manufacturers: The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Acrylic Emulsion Latex Sealants:
 - a. Bostik.
 - b. Pecora Corp.
 - c. Sonneborn Building Products.
 - d. Tremco, Inc.
 - 2. Polyurethane Sealants:
 - a. Bostik.
 - b. Master Builders.
 - c. Pecora Corp.
 - d. Sonneborn Building Products.
 - e. Tremco, Inc.

3. Butyl Sealants:
 - a. Bostik.
 - b. TEC Incorporated.
 - c. Tremco, Inc.
4. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. NOTE: The use of silicone sealants shall not be used at any exterior conditions.
- B. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component. (Silicone sealant shall not be used at exterior conditions).
 1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry, stone or concrete.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- C. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
 1. Applications: Use for:
 - a. Concealed sealant bead in sheet metal work.
- D. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
 1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between interior door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
 - d. CMU Interior Corners – Urethane for Painting.
- E. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, nonskinning.
 1. Applications: Use for concealed locations only:
 - a. Sealant bead between top stud runner and structure and between bottom stud track and floor or wall.
- F. Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, M and A; single component.
 1. Color: Standard color matching finished surfaces.
 2. Applications: Use for:
 - a. Joints in sidewalks and paving, either vehicular or pedestrian.
 - b. Isolation joints and control joints in slabs on grade.
- G. Bituminous and Fiber Joint Filler (BtmF-JF) provide resilient and non-extruding type premolded bituminous-impregnated fiberboard units complying with ASTM D 1751; FS HH-F-341, Type I; or AASHTO M213.

H. Miscellaneous Materials:

1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
2. Bond Breaker Tape (BB-Tp): Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
3. Sealant Backer Rod (S-BR): provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.
 - a. Rod Size to Joint Width: Size of all backer rod width shall be 2 times the width of joint/gap to be sealed.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine substrate, (joint surfaces) and conditions under which joint sealer work is to be performed and must notify Prime Contractor of unsatisfactory conditions.

3.2 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of gaskets, sealants or caulking compounds. Remove dirt, insecure coatings, moisture and other substrate which could interfere with seal of gasket or bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealant. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.
- E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of beads;
- G. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.

- H. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- I. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.
- J. Bond ends of gaskets together with adhesive of "weld" by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.

3.4 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Prime Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION

SECTION 08100 - STEEL DOOR FRAMES

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 SUMMARY

- A. This Section includes:
 - 1. Steel Frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Wood Doors" for solid-core wood doors installed in steel frames.
 - 3. Division 8 Section "Finish Hardware" for door hardware and weatherstripping.
 - 4. Division 8 Section "Glazing" for glass in steel doors and sidelights.
 - 5. Division 9 Section "Gypsum Board Assemblies".
 - 6. Division 9 Section "Painting".

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.
- C. Shop Drawings: Submit for fabrication and installation of steel door frames. Include details of each frame type, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Frame Schedule: Submit schedule of frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for factory-finished frames.
- F. Samples for verification of each type of exposed finish required, prepared on Samples not less than 3 by 5 inches (75 by 125 mm) and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1.4 QUALITY ASSURANCE

- A. Provide frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished frames.
- B. Inspect frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

- C. Store frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on frames become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked frames to promote air circulation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Pioneer Industries
 - 2. Rocky Mountain Metals, Inc.
 - 3. Republic Frames/Allegion
 - 4. Steelcraft - Allegion
 - 5. Amweld Building Products Div.
 - 6. Ceco Corp.
 - 7. Curries Mfg. Inc.
 - 8. Fenestra.
 - 9. Bymoco
 - 10. Mesker

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M) and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, and ASTM A 568.
- C. Supports and Anchors: Fabricated from not less than 18 gauge galvanized steel sheet.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.
- E. Shop Applied Paint:
 - 1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

2.3 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100 and of types and styles as shown on Drawings and schedules.
- B. Conceal fastenings, unless otherwise indicated. Fabricate frames as follows:
 - 1. Fabricate frames with mitered or coped and face welded corners.
 - 2. Interior Frames: 16 gage cold rolled steel
 - 3. Exterior Frames: 14 gage A60 galvanized steel.
- C. Door Silencers: Except on weather stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- D. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- E. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry."

2.4 FABRICATION

- A. Fabricate steel door frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
 - 1. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- B. Galvannealed Steel Frames: For the following locations, fabricate door frames from galvannealed steel sheet according to SDI 112.
 - 1. At exterior locations.
 - 2. Where indicated.
- C. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- D. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier.
- E. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- F. Reinforce doors frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- G. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes. Apply primers and organic finishes to doors and frames after fabrication.

2.6 GALVANIZED STEEL SHEET FINISHES

- A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC- Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.7 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Install steel door frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. Install foot brace at bottom of all metal frames until installation of door. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. Metal frames at all interior wall conditions shall be inset 1/4" from edge of wall to allow for caulk bead, see detail on drawings.
 - 3. In plaster or masonry walls constructed with antifreeze additives, protect inside (concealed) faces of door frames using fibered asphalt emulsion coating. Apply approximately 1/8" thick over shop primer and allow to thoroughly dry before handling.
 - 4. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 5. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
 - 6. Install fire-rated frames according to NFPA 80.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08211 - WOOD DOORS

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 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
 - 2. Factory finishing of flush wood doors.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
 - 1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- D. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:
 - 1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.
 - 2. Faces of factory-finished doors with opaque finish. Show the full range of colors available.
- E. Samples for verification in the form and size indicated below:
 - 1. Corner sections of doors approximately 12 inches (300 mm) square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

1.4 QUALITY ASSURANCE

- A. Quality Standard: Comply with the following standard:
 - 1. NWWDA Quality Standard: I.S.1-A, "Architectural Wood Flush Doors," of the National Wood Window and Door Association.
 - 2. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
- B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Oversized Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors conform to all standard construction requirements of tested and labeled fire-door assemblies except for size.
 - 2. Temperature Rise Rating: At stairwell enclosures, provide doors that have a temperature rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

3. Temperature Rise Rating: At stairwell enclosures, provide doors that have a temperature rise rating of 250 deg F (139 deg C) maximum in 30 minutes of fire exposure.

- C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE & HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.
 1. Comply with Technical Bulletin 420-R for delivery, storage, and handling of doors.
- B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.
 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
 - a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work (No other Manufacturer to be used unless prior approved by addenda)
- B. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:
 1. Oshkosh Door Company; 2501 Universal Street, P.O. Box 2468, Oshkosh, WI 54904; Ph.: 920.233.6161; www.oshkoshdoor.com.
 2. VT Industries; 1000 Industrial Park, P.O. Box 490, Holstein, IA 51025; Ph.: 712.368.4381; www.vtindustries.com.
 3. Haley Brothers, Inc.; 6291 Orangethorpe Ave., Buena Park, CA 90620; Ph.: 714.670.2112; www.haleybros.com.

2.2 INTERIOR FLUSH WOOD DOORS

- A. Solid Core Doors for Transparent Finish: Comply with the following requirements:
 1. Faces: Plain Sliced White Birch, Book/Run Matching
 2. Grade: Premium "A"

3. Construction: 5 ply, Hot Pressed
 4. Core: Particleboard Core to meet or exceed ANSI/A208.1 for 1-LD-1 or 1-LD-2 door core
 5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
 6. Pair Matching: Required at all pairs of doors.
- B. Fire-Rated Solid Core Doors: Comply with the following requirements:
1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
 2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
 3. Edge Construction: Provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance compatible hardwood
 4. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.
 5. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.3 FABRICATION

- A. Fabricate flush wood doors to comply with following requirements:
1. In sizes indicated for job-site fitting.
 2. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 3. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
 - b. Metal Astragals: Pre-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

2.4 SHOP PRIMING

- A. Transparent Finish: Shop-seal faces and edges of doors for transparent finish with stain (if required), other required pretreatments, and first coat of finish as specified.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
1. Grade: Premium.
 2. Finish: AWI System TR-6 or better in Factory standard color as directed by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Division 8 Section "Door Hardware."
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4-mm) clearance from bottom of door to top of threshold.
 - 2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 - 3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 4. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish after installation, if fitting or machining is required at the job site.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08410 - ALUMINUM STOREFRONTS

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 DESCRIPTION OF WORK

- A. Extent of aluminum entrances and storefronts is indicated on drawings and schedules.
- B. Types of aluminum entrances required include the following:
 - 1. Interior and Exterior Storefront Doors.
- C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts specified herein to be factory pre-glazed.

1.3 SYSTEM PERFORMANCES

- A. General: Provide exterior entrance and storefront assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated. System shall be of design styles indicated. System components and accessories shall be from the same manufacturer, to the maximum extent possible.
- B. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 degree F.
- C. Wind Loading: Provide capacity to withstand loading indicated below, tested per ASTM E 330.
 - 1. Uniform pressure of 20 psf inward and 20 psf outward.
- D. Transmission Characteristics of Fixed Framing: Comply with requirements indicated below for transmission characteristics and test methods.
 - 1. Air and Water Leakages: Air infiltration of not more than 0.06 CFM per sq. ft. of fixed area per ASTM E 283 and no uncontrolled water penetration per ASTM E 331 at pressure differential of 6.24 psf (excluding operable door edges).
 - 2. Condensation Resistance: Not less than 51 CRF per AAMA 1502.7.
 - 3. Thermal Transmittance: U-value of not more than 0.65 Btu/(hr x sf x degree F) per AAMA 1503.1.
- E. Transmission Characteristics of Entrances: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods.
 - 1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E 283 at pressure differential of 1.567 psf.
 - 2. Condensation Resistance: Not less than 48 CRF per AAMA 1502.7.
 - 3. Thermal Transmittance: U-value of not more than 0.93 Btu/(hr x sf x degree F) per AAMA 1503.1.

1.4 QUALITY ASSURANCE

- A. Drawings: Plans, elevations and details show spacings of members as well as profile and similar dimensional requirements of aluminum entrances and storefront work. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in Architect's sole judgment, such deviations do not materially detract from design concept or intended performances.

1.5 SUBMITTALS

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

ALUMINUM STORE FRONT
08410-1

- A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and storefronts required for project, including test reports certifying that products have been tested and comply with performance requirements.
- B. Samples: Submit samples of each type and color of aluminum finish on 12" long sections of extrusions or formed shapes and on 6" square sheets. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

PART 2 - PRODUCTS

2.1 ALUMINUM FRAMES & STOREFRONTS

- A. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Kawneer North America
 - 2. Tubelite, Inc.
 - 3. Coral Industries, Inc./Coral Architectural Products
 - 4. YKK AP America, Inc.
 - 5. Oldcastle
 - 6. Record
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusion, ASTM B 209 for sheet/plate.
- B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.
 - 1. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
 - 2. Provide Phillips flat-head machine screws for exposed fasteners.
- C. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum, 0.062" minimum, of an alloy and type selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- F. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.
- G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000 or molded PVC gaskets complying with ASTM D 2287.
- H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

- I. Glass and Glazing Materials: Provide glass and glazing materials which comply with requirements of "Glass and Glazing" section of these specifications.

2.3 HARDWARE

- A. General: Hardware shall comply with requirements of the "Americans with Disabilities Act". Refer to hardware section of Division 8 for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances.
 - 1. Push/Pull Handles: CO-9 design, by Kawneer. Finish as per the Door Schedule.
 - 2. All other hardware shall be as per Section 08700, Finish Hardware.

2.4 FRAMING

- A. Types:
 - 1. Storefront type framing system for insulated exterior applications:
 - a. Framing system shall be equal to TriFab Versaglaze 451, by Kawneer.
 - 2. Storefront type framing system for non-insulated interior applications:
 - a. Framing system shall be equal to TriFab Versaglaze 450, by Kawneer.
- B. General:
 - 1. Support Members: Extruded aluminum alloy 6063-T6 or 6061-T6 complying with ASTM B-221.
 - 2. Flashing/Closures: Formed aluminum 5005-H34 alloy, min. thickness .040", complying with ASTM B-209.
 - 3. Cap System: Manufacturer's standard cap glazing system consisting of rectangular (rafter) and beveled (horizontal) glazing gaps which will secure all sides of each light of glass against negative and positive loads.
 - 4. Fasteners: A300 stainless steel.
 - 5. Sealant: Silicone (FS TT-S-0015 43A and TT-S-0023 o.c.)

2.5 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
 - 1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 - 3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.
- D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.
- E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- F. Fasteners: Conceal fasteners wherever possible.

- G. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
 - 1. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

2.6 STOREFRONT FRAMING SYSTEM

- A. General: Provide inside-outside matched center glazed system with provisions for glass replacement. Shop-fabricate and preassemble frame components where possible.

2.7 ALUMINUM DOOR FRAMES

- A. Fabricate tubular and channel frame assemblies, as indicated, with either welded or mechanical joints in accordance with manufacturer's standards, reinforced as necessary to support required loads.

2.8 FINISHES

- A. Baked Enamel Finish: Premium color selection equal to Kawnear #22 Stock Permafluor Architectural Coating (Hylar 5000 or Kynar 500), factory applied and oven baked for a topcoat thickness of 1.0 - 1.3 mils.
 - 1. Color to be selected by Architect after bid date from manufacturer standards
 - 2. Color selections MUST include "White".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- C. Drill and tap frames and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- D. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
- E. Refer to "Glass and Glazing" section of Division 8 for installation of glass and spandrel panels indicated to be glazed into framing, and not preglazed by manufacturer.

3.3 ADJUST AND CLEAN:

- A. Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.
- B. Clean completed systems, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces.
- C. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08700 - FINISH HARDWARE

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 this Section.

1.2 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. Hinges.
 - 2. Key control system.
 - 3. Lock cylinders and keys.
 - 4. Lock and latch sets.
 - 5. Bolts.
 - 6. Exit devices.
 - 7. Push/pull units.
 - 8. Closers.
 - 9. Overhead holders.
 - 10. Miscellaneous door control devices.
 - 11. Door trim units.
 - 12. Protection plates.
 - 13. Weather-stripping for exterior doors.
 - 14. Sound stripping for interior doors.
 - 15. Astragals or meeting seals on pairs of doors.
 - 16. Thresholds.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Standard Steel Doors and Frames" for silencers integral with hollow metal frames.
 - 2. Division 8 Section "Flush Wood Doors" for factory pre-fitting and factory pre-machining of doors for door hardware.
 - 3. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum entrance door hardware, except cylinders.

1.3 HARDWARE ALLOWANCE

- A. Allowance of \$1,500.00 for Certified AHC (Architectural Hardware Consultant) – document of certification from DHI must be provided) to visit job site upon substantial completion as directed by Architect. A written report will be required for the Owner, Architect, and Contractor

1.4 QUALITY ASSURANCE

- A. Door hardware supplier's responsibilities shall be as follows:
 - 1. Submittals: Submit through Contractor required product data, final hardware schedule;

separate keying schedule, and samples as specified in this Section, unless otherwise indicated.

2. **Hardware Review Meeting:** Hardware Supplier shall attend a scheduled "Hardware Review Meeting" with the Contractor, Owner and Architect representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Hardware Supplier understands the Hardware Submittal is not deemed "Fully Approved" until the Owner has completed their review and given "Approval".
 3. **Construction Schedule:** Inform Contractor promptly of estimated times and dates that will be required to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing door hardware for purposes of including this data in construction schedule. Comply with this schedule.
 4. **Coordination and Templates:** Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.
 5. **Product Handling:** Package, identify, deliver, and inventory door hardware specified in this Section.
 6. **Discrepancies:** Based on requirements indicated in Contract Documents in effect at time of door hardware selection, furnish types, finishes, and quantities of door hardware, including fasteners, and Owner's maintenance tools required to comply with specified requirements and as needed to install and maintain hardware. Furnish or replace any items of door hardware resulting from shortages and incorrect items at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.
- B. Contractor's responsibilities shall be as follows:
1. **Submittals:** Coordinate and process submittals for door hardware in same manner as submittals for other work.
 2. **Hardware Review Meeting:** Contractor is to schedule and attend a "Hardware Review Meeting" with the Owner, Hardware Supplier and Architect Representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Contractor understands the Hardware Submittal is not deemed "Fully Approved" until the Owner has completed their review and given "Approval".
 3. **Construction Schedule:** Cooperate with door hardware supplier in establishing scheduled dates for submittals and delivery of templates and door hardware. Incorporate in construction schedule the times and dates related to furnishing hardware by door hardware supplier.
 4. **Coordination:** Coordinate door hardware with other Work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier. Coordinate all wiring, raceways, accesses and final connections to all electronic devices and components per manufacturer requirements for a fully functioning system.
 5. **Product Handling:** Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials.
 6. **Installation Information:** The general types and approximate quantities of hardware required for this Project are indicated at the end of this Section in order to establish Contractor's costs for installation and other work not included in allowance.
 7. No adjustments in Contract sum will be made for costs other than those covered by the allowances for subsequent increases or decreases in quantity of one or more hardware types that do not exceed 5 percent.

1.5 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.
- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Upon return of the reviewed finish hardware schedule, arrange for a meeting with the Owner and representatives of Architect. A keying schedule will be established and submitted to the Architect and Owner. After review, the keying schedule will be returned to representatives of Finish Hardware Supplier so that permanent cylinders and keys can be prepared on a timely basis.

1.6 QUALITY ASSURANCE

- A. Substitutions: All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.
- B. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- C. 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 a minimum of 10 years, for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced " Certified "architectural hardware consultant (AHC)" as recognized by the Door and hardware Institute (DHI). All submittals shall be signed by an AHC who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.7 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.

1.8 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 HINGES

A. MANUFACTURERES

1. Ives
2. McKinney
3. Bommer

B. MATERIAL:

1. Provide only template produced units
2. Provide Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head wood screws for installation of units in to wood. Finish screw heads to match surface of hinges or pivots.
3. Hinge pins, except as noted, are to be provided as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-ferrous Hinges: Stainless steel pins
 - c. Exterior Doors: Use Non-Removable Pins
 - d. Interior Doors: Non-rising pins
 - e. Electric Hinges: Non-removable pins
4. Tips shall be flat button and matching plug, finished to match leaves.
5. Provide number of hinges indicated but not less than three (3) hinges for door leaf of 90" or less in height and one additional hinge for each 30" of additional height.
6. Provide ball bearing hinges of the type and weight suggested by the hinge manufacturer for each type of door application.

2.2 LOCK CYLINERS AND KEYING:

A. MANUFACTURERES

1. Schlage Everest 29R Series SFIC Cores & Keys

B. MATERIAL

1. Provide a new master key for the Project.
2. 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.
3. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
4. 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.
5. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".
6. Key Material: Provide keys of nickel silver only.
7. 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.
 - a. Furnish one extra blank for each lock.
 - b. Furnish construction master keys to General Contractor.
 - c. Deliver keys to Owner.

2.3 LOCKSETS AND LATCHSETS

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FINISH HARDWARE
08700-4

A. MANUFACTURERES

1. Schlage ND / ALX Series, SPA design
2. Corbin CL3300 Series, PSA Design
3. Sargent 10 Line Series, LP Design

B. MATERIAL

1. Locksets and latch-sets of all manufacturers must conform to the requirements of Sub paragraphs 2 and be approved by the Architect.
2. Cylindrical Lock Type
 - a. Locksets and latch sets must conform to ANSI A156.2 Series 4000, Operational Grade 1 or grade 2 as specified in the door hardware sets. Locks and latches are to be UL Listed.

2.4 EXIT DEVICES

A. MANUFACTURERES

1. Von Duprin 98 Series
2. Sargent 8000 Series
3. Detex 10 Series

B. MATERIAL

1. All exit devices to be of one manufacturer and provided in same finish design as locksets.
2. Provide sex nuts and bolts for attachment of surface applied items to doors.
3. Devices shall be UL listed. Devices for fire rated openings shall bear factory installed UL markings that indicate approval for fire rated openings.
4. All exit devices shall be touch-bar type design.
5. All exit devices shall comply with ANSI A156.3, Grade 1.
6. Exit device lever trim shall be equal to Von Duprin break away vandal resistant #996L.
7. All exit devices shall be equipped with flush end caps.
8. All exit devices shall be equipped with guarded (deadlocking) latch bolts.
9. Security Indicators for "Keyed Cylinder Dogging" - Provide Von Duprin "CDSI", dogging indicator provides an at-a-glance verification of the status of the door from inside of the room. Visible "LOCKED" and "UNLOCKED" indicators show whether the device is undogged or dogged.
10. Security Indicators for "-2SI-Classroom Exit Device Locking Lever Trim". The "-2SI" Security Indicator provides an at-a-glance verification of the LOCKED/UNLOCKED status of the door from inside of the room. Facility staff to be able to lock/unlock outside exit device lever trim from classroom side of door, avoiding corridor exposure.
11. All exit devices shall be provided with anti-microbial coated stainless steel touch bars. Plastic touch pads or plastic covered touch pads will not be accepted.
12. All exit devices at wood and hollow metal doors are to be installed using through-bolts. All exit devices and exit device strikes shall be installed using manufacturer's supplied fasteners. Substitution of manufacturer's fasteners will not be allowed.

2.5 CLOSERS

A. MANUFACTURERES

1. LCN 4000 series
2. Corbin DC8000 Series

3. Norton 9500

B. MATERIAL

1. Size of units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
 - a. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
 - b. Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units, ANSI opening force and delayed action closing.
2. All closers are to be fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons. Closer Piston diameter at exterior doors shall be minimum 1½". Hydraulic regulation to be controlled by tamper-proof, non-critical screw valves, adjustable with a hex by tamper-proof, non-critical screw valves, adjustable with a hex wrench. Separate adjustments for back check, general speed, and latch speed. Where detailed in the door hardware sets, provide delayed action feature to delay closing up to one minute for maximum opening to approximately 75. Back check shall be properly located for protection of the door, frame and applied hardware.
3. All door closers shall comply with ANSI A156.4 Grade 1 and meet the standards of ANSI A117.1 for barrier-free accessibility.
4. Provide closers with full metal covers.
5. All closers are to be through bolt mounted. All door closers are to be installed using manufacturer supplied fasteners. Substitution of manufacturers supplied fasteners is not permitted.
6. All surface door closers are to be provided with required mounting brackets, mounting plates, drop plates, shims, spacers, arms, special templating, etc. as required for the specified closer and arm function, whether specified in the door hardware sets or not.

2.6 OVERHEAD STOPS AND HOLDERS

A. MANUFACTURERES

1. Glynn Johnson
2. Sargent
3. Rixson

B. MATERIAL

1. Conform to ANSI A156.8 Grade 1.

2.7 PUSH/PULLS & PROTECTION PLATES

A. MANUFACTURERES

1. Ives
2. Trimco
3. Burns

B. MATERIAL

1. Provide manufacturers standard exposed fasteners for installation, through bolted for matched pairs, but not of single units.
2. Provide 16 gauge minimum thickness for plates.
3. Where specified in the schedule, push/pulls shall have an antimicrobial coating.

2.8 THRESHOLDS, WEATHERSTRIPPING & GASKETING

A. MANUFACTURERES

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Troy, Alabama

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1. Zero
2. National Guard
3. Pemko

B. MATERIAL

1. Provide continuous weather-stripping at each edge of every exterior door leaf, except as otherwise indicated.
2. Provide type, size and profile shown as scheduled.
3. Provide non-corrosive fasteners as recommended by manufacturer for application indicated. Do not specify adhesive backed weather-strip or gasket material.
4. Where replaceable seal strips are scheduled, provide only those units where resilient or flexible seal strip is easily replaceable from stocks maintained by manufacturer.
5. Proved standard metal threshold unit of type, size and profile shown as scheduled.

2.9 FINISHES

- A. Hardware finishes shall conform to ANSI and shall be as listed below for aluminum, FRP, hollow metal and wood doors:

B. Finishes Table:

Butt Hinges	652 Satin Chrome Plated Steel
Continuous Geared Aluminum Hinges	Wood and Hollow Metal Doors: 628 Clear Anodized Aluminum. Aluminum Doors: Hinge finish shall be same as specified for frame and door. Hinge finish should blend in with aluminum frame and door.
Flush Bolts	626 Satin Chrome Plated
Locksets	626A Satin Chrome Plated
Exit Devices	626 Satin Chrome Plated
Door Closers	689 Powder Coat Aluminum
Protective Plates	630 Satin Stainless Steel
Door Stops	626 Satin Chrome Plated

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each hardware item in compliance with 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, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item.
1. Do not install surface mounted items until finishes have been completed on the substrate.
- B. Conform to ANSI A117.1 for positioning requirements for the handicapped.

3.2 PROTECTION AND CLEANING

- A. After installation, clean metal surfaces on both interior and exterior of all mortar, paint and other contaminants. After cleaning, protect work against damage.

3.3 FINAL ADJUSTMENT

- A. Whenever hardware is installed more than one month prior to occupancy or acceptance, return during the week prior to acceptance or occupancy and make a final inspection and adjustment of all hardware items in such space or area.

3.4 SCHEDULE

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FINISH HARDWARE
08700-7

HARDWARE SET: A01

DOOR NUMBER:

104

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	DEADLOCK	L460H	SCH
1	PERMANENT CORE	80-037	SCH
1	PUSH PLATE	1820 4" X 16"	IVE
1	PULL PLATE	8303 8" PULL, 4" X 16"	IVE
1	SURFACE CLOSER	1461 EDA-H FPC TBSRT	LCN
1	ARMOR PLATE	8400 34 X 1 ½" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	ZER

HARDWARE SET: A02

DOOR NUMBER:

103

115

116a

119

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5 NRP	IVE
1	STOREROOM LOCKSET	ALX80H 10-025 K510-066	SCH
1	SURFACE CLOSER	1461 RW/PA FPC TBSRT	LCN
1	PERMANENT CORE	80-037	SCH
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	THRESHOLD	566A	ZER
1	SWEEP	351AA	ZER
1	GASKETING	9188BK	ZER

HARDWARE SET: A03

DOOR NUMBER:

109

113

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	PASSAGE SET	ND10	SCH
1	SURFACE CLOSER	1461 RW/PA FPC TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	9188-BK	ZER

HARDWARE SET: A04 – NOT USED

HARDWARE SET: A05

DOOR NUMBER:

101a

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	FIRE EXIT DEVICE	98-L-F-996L-17-SNB	VON
1	RIM CYLINDER W/CONST. CORE	80-159	SCH
1	PERMANENT CORE	80-037	SCH
1	SURFACE CLOSER W/STOP	4040XP DEL SCUSH DROP PLATE TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	9188-BK	ZER

HARDWARE SET: A06

DOOR NUMBER:

107

114

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCKSET	ALX80H 10-025 K510-066	SCH
1	PERMANENT CORE	80-037	SCH
1	SURFACE CLOSER	1461 RW/PA FPC TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	ZER
1	GASKET SEAL	9188-BK (DOOR 107 ONLY)	ZER

HARDWARE SET: A07

DOOR NUMBER:

101B

116

117

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM LOCKSET	ND70H 10-025 K510-066	SCH
1	PERMANENT CORE	80-037	SCH
1	SURFACE CLOSER	1461 SCUSH FPC TBSRT	LCN
1	KICK PLATE	8400 8" X 1 ½" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	9188S-BK	ZER

HARDWARE SET: A08

DOOR NUMBER:

105

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCKSET	ND70H 10-025 K510-066	SCH
1	PERMANENT CORE	80-037	SCH
1	MOP PLATE	8400 6 X 1 ½" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	ZER

HARDWARE SET: A09

DOOR NUMBER:

106

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE LOCKSET	ALX53H 10-025 K510-066	SCH
1	PERMANENT CORE	80-037	SCH
1	SURFACE CLOSER	1461 RW/PA FPC TBSRT	LCN
1	KICK PLATE	8400 8" X 1 ½" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	9188S-BK	ZER

HARDWARE SET: A10

DOOR NUMBER:

102

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
2	FLUSH BOLTS	458-12	IVE
1	CLASSROOM LOCKSET	ALX70H 10-025 K510-066	SCH
1	PERMANENT CORE	80-037	SCH
1	CYLINDRICAL LOCKGUARD	1082-4	TRI
2	OVERHEAD STOPS	90S SNB (95 DEGREE)	GLY
2	ARMOR PLATE	8400 34" X 1 ½" LDW B-CS	IVE
2	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
2	WALL STOP	WS401/402CVX	IVE
2	SILENCERS	SR64	ZER

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FINISH HARDWARE
08700-10

HARDWARE SET: AL-01

DOOR NUMBER:

108

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-35A-NL-OP-388-SNB	VON
1	RIM CYLINDER	80-159	SCH
1	MORTISE CYLINDER HOUSING W/CONSTRUCTION CORE	80-132	SCH
2	PERMANENT CORES	80-037	SCH
1	SPECIAL OFFSET PULL	8190EZHD-2-O	IVE
1	SURFACE CLOSER W/STOP	4040XP DEL SCUSH DROP PLATE TBSRT	LCN
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY FRAME/DOOR SUPPLIER	

**NOTE: CONTINUOUS GEAR HINGE FINISH TO BE SAME AS SPECIFIED FOR FRAME AND DOOR.
ALL OTHER HARDWARE ITEMS TO BE AS SPECIFIED IN PREAMBLE.**

HARDWARE SET: AL-02

DOOR NUMBER:

104a

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	DEADLATCH	4510	ADA
1	LATCH PADDLE	4590	ADA
1	MORTISE CYLINDER HOUSING W/CONSTRUCTION CORE	80-133	SCH
2	PERMANENT CORES	80-037	SCH
1	PUSH / PULL BAR SET	9190EZHD-12" PULL, HORIZONTAL BAR CTC AS REQ'D	IVE
1	SURFACE CLOSER W/HOLD OPEN/STOP	4040XP DEL SHCUSH DROP PLATE TBSRT	LCN
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY FRAME/DOOR SUPPLIER	

**NOTE: CONTINUOUS GEAR HINGE FINISH TO BE SAME AS SPECIFIED FOR FRAME AND DOOR.
ALL OTHER HARDWARE ITEMS TO BE AS SPECIFIED IN PREAMBLE.**

HARDWARE SET: AL-03

DOOR NUMBER:

101

110

EACH TO HAVE:

2	CONT. HINGE	112XY EPT NOTCH	IVE
2	POWER TRANSFER HINGES	EPT-10-CON	VON
1	KEYED REMOVABLE MULLION	KR4954	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR AND TOUCH PAD MONITOR SWITCH	CDSI-RX-LC-35A-EO-299	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	QEL-RX-LC-35A-NL-OP-388-299	VON
1	RIM CYLINDER	80-159	SCH
3	MORTISE CYLINDER HOUSING W/CONSTRUCTION CORE	80-132	SCH
4	PERMANENT CORES	80-037	SCH
2	SPECIAL OFFSET PULLS	8190EZHD-2-O	IVE
2	SURFACE CLOSER W/STOP	4040XP DEL SCUSH DROP PLATE TBSRT	LCN
1	MULLION SEAL	139N-PSA	ZER
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY FRAME/DOOR SUPPLIER	
2	WIRE HARNESS-EPT TO ABOVE CEILING	CON-192P	VON
2	WIRE HARNESS-EPT TO EXIT DEVICE	CON-__P	VON
2	WIRE LEADS TO POWER SUPPLY	CON-6W	VON
2	DOOR POSITION SWITCHES	679-05HM	SCE
1	POWER SUPPLY	PS902-4RL	VON
1	CARD READER	PROVIDED BY ACCESS CONTROL INTEGRATOR	

**NOTE: CONTINUOUS GEAR HINGE FINISH TO BE SAME AS SPECIFIED FOR FRAME AND DOOR.
ALL OTHER HARDWARE ITEMS TO BE AS SPECIFIED IN PREAMBLE.**

OPERATION: CARD READER UNLOCKS DOOR FOR AN ADJUSTABLE TIME PERIOD. EXIT DEVICE MONITOR SWITCH REPORTS AUTHORIZED EGRESS. DOOR POSITION SWITCH REPORTS DOOR OPEN, CLOSED OR FORCED OPEN.

END OF SECTION

SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for windows
 - 2. Glass for doors
 - 3. Glass for storefront framing.
 - 4. Glazing sealants and accessories.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass as defined in referenced glazing publications.
- B. Glass Fabricators: Firms that produce the fabricated glass products. Fabrication processes include cutting, heat processing, insulating, spandrel, laminating and other as fabrication activities defined in referenced glazing publications.

1.3 REFERENCE STANDARDS

- A. American Society of Test and Material (ASTM)
 - 1. ASTM C1036: Standard Specification for Flat Glass
 - 2. ASTM C1048: Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass
 - 3. ASTM C1172: Standard Specification for Laminated Architectural Flat Glass
 - 4. ASTM C1376: Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
 - 5. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials
 - 6. ASTM E1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
 - 7. ASTM E1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
 - 8. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation
- B. American National Standards Institute (ANSI)
 - 1. ANSI z97.1: For Safety Glazing Materials Used In Buildings - Safety Performance Specifications And Methods Of Test
- C. Consumer Products Safety Commission
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- D. International Code Council
 - 1. ICC 500: ICC/NSSA Standard for the Design and Construction of Storm Shelters
- E. Underwriters Laboratory (UL)
 - 1. UL 263: Standard for Fire Tests of Building Construction and Material
 - 2. UL 9: Standard for Fire test of Window Assemblies
 - 3. UL 10B: Standard for Fire Tests of Door Assemblies
 - 4. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies

F. National Fire Protection Association (NFPA)

1. NFPA 80: Standard for Fire Doors and Other Opening Protectives
2. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies
3. NFPA 252: Standard Methods of Fire Test of Door Assemblies

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product provide performance characteristics, certificates of compliance, installation instructions, and cleaning and maintenance instructions.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12" x 12" inches (300 mm) square. For each type of sealant/gasket exposed to view; 12" length sample. Install sealant/gasket sample between two strips of materials representative of adjoining framing system in color.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

1.7 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Single Source Responsibility: Provide materials obtained from one source for each type of glass and glazing product indicated

1.8 PRECONSTRUCTION TESTING

Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass

is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five (5) years from date of Substantial Completion.

- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturers: Subject to compliance with requirements, provide AGC Glass North America, Inc or approved equal product by one of the following:
1. Vitro Architectural Glass (Basis of Design)
 2. Guardian Glass.
- B. Approved Fabricators: Subject to compliance with requirements
1. American Insulated Glass
 2. OldCastle Building Envelope
 3. Trulite Glass and Aluminum Solutions
 4. Tristar Glass

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design glazing. A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the 2021 International Building Code and ASTM E 1300.
1. Design Wind Pressures: As indicated on Drawings.
 2. Design Snow Loads: As indicated on Drawings.
- C. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.3 computer program, expressed as Btu/sq. ft. x h x deg F.
 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBNL's WINDOW 7.3 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Laminated Glazing Reference Manual", "Glazing Manual", and "Sealant Manual".
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.
- F. Heat-Treated Float Glass: Where heat treated float glass is required or indicated provide glass in accordance to ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seals.
 - a. Primary Seal: Polyisobutylene
 - b. Secondary Seal: Two-part Silicone
 - 2. Spacer: Manufacturer's standard spacer material and construction
 - a. Color: As select by architect from fabricators full range of colors

2.6 FIRE PROTECTIVE-RATED GLASS

- A. Fire -Protective -Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire -protection ratings indicated, based on positive -pressure testing according to NFPA 257 or UL 9, including the hose -stream test, and shall comply with NFPA 80.
 - 1. Fire -protection -rated glazing required to have a fire -protection rating of 20 minutes shall be exempt from the hose -stream test.
- B. Fire -Protective -Rated Glazing Labeling: Permanently mark fire -protection -rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose -stream test; whether or not glazing meets 450 deg F (250 deg C) temperature -rise limitation; and the fire -resistance rating in minutes.
- C. Fire -Protective -Rated Tempered Glass: 6 -mm thickness, fire -protection -rated tempered glass; and complying with 16 CFR 1201, Category II.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Safti First; SuperLite I
 - b. Technical Glass Products; Fireglass20
 - c. Vetrotech Saint-Gobain; SSG Pyroswiss US
- D. Fire-Protective Rated Ceramic: 5mm thickness, fire protective rated ceramic, non-safety rated
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum
 - b. Technical Glass Products Firelite
- E. Fire-Protective Rated Ceramic-Filmed: 5mm thickness, fire protective rated ceramic, safety rated, complying with 16 CFR 1201, Category II
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum-F
 - b. Technical Glass Products Firelite-NT
- F. Fire-Protective Rated Ceramic-Laminated: 9mm thickness, fire protective rated ceramic, safety rated, complying with 16 CFR 1201, Category II
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum-L
 - b. Technical Glass Products Firelite-Plus

2.7 GLAZING SEALANTS

- A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation.
 - f. Tremco Incorporated.
- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Polymeric Systems, Inc.
 - f. Schnee-Morehead, Inc., an ITW company.
 - g. Sika Corporation.
 - h. Tremco Incorporated.
- D. Glazing Compounds for Fire-rated Glazing Materials
1. Glazing Compound: DAP 33 putty
 2. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S;
 3. Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
 - a. Dow Corning 795 - Dow Corning Corp.
 - b. Silglaze-II 2800 - General Electric Co.
 - c. Spectrem 2 - Tremco Inc

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer

rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- C. Fire-rated Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Non-Fire Rated Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Fire-rated Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant where indicated.
- F. Center glass lites in openings on setting block and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape where indicated.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
Protect glass from contact with contaminating substances resulting from construction operations.
Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at

frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- B. Remove and replace glass that is damaged during construction period.
- C. Wash glass on both faces not more than 4 days prior to date scheduled for inspection intended to establish date of substantial completion in each area of the project. Wash glass with methods as recommended by glass manufacturer.

3.6 INSULATING GLASS SCHEDULE

- A. Glass Type **[IG-3]**: Tinted Low-E insulating glass.
 1. Basis-of-Design Product: Vitro Architectural Glass.
 2. Overall Unit Thickness: 1 inch (25 mm).
 3. Minimum Thickness of Each Glass Lite: 6 mm.
 4. Outdoor Lite: Tinted fully tempered float glass.
 5. Tint Color: Pure Grey, Bronze or Forest Green.
 - a. Color to be selected by Architect after Bid Date.
 6. Interspace Content: Air.
 7. Indoor Lite: Clear fully tempered float glass.
 8. Low-E Coating: Sputtered on second surface
 9. Winter Nighttime U-Factor: .29 maximum.
10. Summer Daytime U-Factor: .27 maximum.
11. Visible Light Transmittance:
 - a. Pure Grey -36 percent minimum.
 - b. Bronze -39 percent minimum.
 - c. Forest Green -48 percent minimum.
12. Solar Heat Gain Coefficient:
 - a. Pure Grey -.25 maximum.
 - b. Bronze -.27 maximum.
 - c. Forest Green -.26 maximum.
13. Safety glazing required.

END OF SECTION

SECTION 09250 - GYPSUM DRYWALL

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 DESCRIPTION OF WORK

- A. Types of work include:
 - 1. Gypsum drywall at walls and ceilings.
 - 2. Drywall finishing (joint tape-and-compound treatment).

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where gypsum drywall systems with fire- resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.
- B. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.
- C. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.
- B. Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Gypsum Board and Related Products:
 - a. Georgia-Pacific Corp.
 - b. Gold Bond Building Products Div., National Gypsum Co.
 - c. United States Gypsum Co.
 - d. CertainTeed Corporation
 - e. Lafarge North America
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Gypsum Wallboard: ASTM C 36, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.
 - 1. Impact/Penetration Resistant Type "X" fire-resistant at locations as identified on the drawings. Equal to Hi-Impact Brand 2000 Fire Shield by National Gypsum. Tested in accordance with ASTM C36/C 1396 Type X, ASTM E 695, ASTM D 1037, ASTM D4977 and ASTM D 4060.
 - 2. Provide Type "MR" moisture resistant, where gypsum board is shown at all wet areas (Restrooms, etc.) install 5/8" moisture resistant gypsum board at all wet walls where plumbing fixtures are shown.
 - 3. Thickness: 5/8" unless otherwise indicated.
 - 4. Edges: Manufacturer's standard.

2.3 TRIM ACCESSORIES

- A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
- B. Non-Beaded Trim: Non-beaded trim shall not be used, except with specific approval by the Architect.

2.4 JOINT TREATMENT MATERIALS

- A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
- B. Joint Tape: Paper reinforcing tape.
- C. Joint Compound: Ready-mixed vinyl-type for interior use.
 - 1. Grade: A single multi-purpose grade, for entire application.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.
- B. Gypsum Board Screws: Comply with ASTM C 646.
- C. Gypsum Board Nails: Comply with ASTM C 514.
- D. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant for concealed applications per ASTM C 919.

- E. Exposed Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable sealant for exposed applications per ASTM C 919.
- F. Water-Resistant Adhesive: Type I organic adhesive for ceramic tile complying with ANSI A136.1.

PART 3 - EXECUTION

3.1 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216.
- B. Locate exposed end-butt joints as far from center of walls possible, and stagger not less than 1'-0" in alternate courses of board.
- C. Install wall/partition boards vertically to avoid end-butt joints wherever possible.
- D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
- E. Locate all edge and end joints over supports. Stagger vertical joints over different studs on opposite sides of partitions.
- F. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- G. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.
- H. Cover both faces of stud framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.
 - 1. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area and may be limited to not less than 75% of full coverage.
- I. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant.
- J. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.2 METHODS OF GYPSUM DRYWALL APPLICATION

- A. Single-Layer Application: Install gypsum wallboard.
- B. On partitions/walls apply gypsum board vertically unless otherwise indicated and provide sheet lengths which will minimize end joints.

3.3 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- D. Install semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive trim with face flanges covered with joint compound.
- E. Provide control joints horizontally and/or vertically at no less than 24'-0" o.c. max. Install vertical

control joints at door and window heads corners. Refer to plans for specific location or installed as directed by Architect.

- F. Install H-molding in exterior gypsum drywall work where control joints are indicated.

3.4 FINISHING OF DRYWALL

- A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.
1. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
 2. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.
 3. Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216.
 4. Provide joint, fastener depression, and corner treatment. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer.
 5. Where gypsum surfaces are to be finished to Level 5 in accordance with GA 214, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.
 6. **All Exposed gypsum board surfaces** shall be finished to a minimum **Level 4** in accordance with GA 214. Except in plenum areas noted below and along with backing board and heavy textured wall covering.
 7. Where gypsum board is to receive eggshell, semi-gloss or gloss paint finish, or where severe, up or down lighting conditions occur, shall be finished to **Level 4** in accordance to GA 214 Level 5, unless indicated otherwise.
 8. All gypsum board surfaces at **all Corridors** shall be finished to **Level 4** in accordance to GA 214 Level 4.
 9. Water resistant gypsum backing board, ASTM C 630/C 630M, to receive ceramic tile shall be finished to **Level 2** in accordance with GA 214.
 10. Walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting shall be finished to **Level 3** in accordance with GA 214.
- B. Partial Finishing: Omit third coat and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.
- C. Refer to section on painting in Division 9 for decorative finishes to be applied to drywall work.

3.5 PROTECTION OF WORK

- A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 09301 - PORCELAIN TILE

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 DESCRIPTION OF WORK

- A. Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.
- B. Extent of tile work is indicated on drawings and schedules.
- C. Types of tile work in this section include the following:
 - 1. Wall Tile.
 - 2. Floor Tile.
 - 3. Wainscot Accent Tile.
 - 4. Wainscot Tile Cap.
 - 5. Base.
 - 6. Stone Thresholds.
- D. Portland cement plaster scratch coat on wall surfaces indicated to receive tile is work of this section.
- E. Sealing expansion and other joints in tile work with elastomeric joint sealers is work of this section.

1.3 QUALITY ASSURANCE

- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
- B. Mock-Up: Contractor shall provide mock-up panels for evaluation of materials, surface preparation techniques and application workmanship.
 - 1. Mock-up panel shall be no less than 4'-0" x 4'-0" panel as follows:
 - a. One (1) panel per room, per surface. (i.e. 1 panel for wall surface and 1 panel for floor surface for each room of different selection).
 - b. Mock-up panels shall be marked identifying room location and product manufacturer, type, style, size and color information.
 - c. Do not proceed with work until materials, workmanship, color, and sheen are approved by Architect.
 - d. Provide additional mock-up panels as required to produce acceptable work.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.
- B. Samples for Selection Purposes: Submit manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection.

1.5 PRODUCT HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at not less than 50 degrees F in tiled areas during installation and for 7 days after completion, unless higher temperatures required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Porcelain Tile:
 - a. StonePeak (Basis of Design)
 - b. American Olean Tile Co.
 - c. Marazzi
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
 - 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with installation products and materials indicated.
- C. Colors, Textures and Patterns: For tile and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standards.
 - 1. Provide tile trim and accessories which match color and finish of adjoining flat tile.
- D. Mounting: Where factory-mounted tile is required provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.
 - 1. Where tile is indicated for installation on exteriors or in wet areas, do not use back or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of use and has been successfully used on other projects.

2.3 TILE PRODUCTS

- A. Provide tile complying with the following requirements:
 - 1. Manufacturer/Series:
 - a. **StonePeak "Simply Modern" Collection.**
 - 2. Type:
 - a. Porcelain
 - 3. Wearing Surface for Floors:
 - a. "stable, firm and slip resistant", (exceeds 0.60 on the ASTM C-1028 test, wet and dry).
 - 4. Nominal Thickness:
 - a. 3/8"

5. Nominal Facial Dimensions as follows:
 - a. Floor Tile
 1. **12" x 24" Floor Tile** - "Simply Modern" Series, Unglazed, with 1/4" grout joints.
 - b. Wall Tile
 1. **12" x 24" Wall Tile** - "Simply Modern" Series, Unglazed, with 1/4" grout joints.
 2. **4" x 12" "Adamas" Series Wall Tile Accent Band – 3 layers high located 6'-0" AFF.** Glazed, with 1/8" grout joints.
 - c. Base:
 1. **6" x 12" Coved Base** - "Schluter Dilex" Series.
 - d. Wainscot Cap:
 1. **3" x 12" Bullnose** - "Simply Modern" Series.
6. Face: Plain with cushion edges.
- B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
 1. Size:
 - a. As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.
 2. Shapes:
 - a. Selected from manufacturer's standard shapes.
 3. External Corners for Portland Cement Mortar Installations:
 - a. Bullnose shape with a radius of not less than 3/4" unless otherwise indicated.
 4. Internal Corners:
 - a. Field-buttet square corners, except use internal cove and cap angle pieces designed to member with stretcher shapes.

2.4 STONE THRESHOLDS

- A. General: Provide stone which is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and abrasion resistant for uses subject to heavy foot traffic.
 1. Provide white, bonded marble complying with MIA Group "A" requirements for soundness.

2.5 SETTING MATERIALS

- A. Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

2.6 GROUTING MATERIALS – FLOOR & WALL

- A. High Performance Epoxy grout that offers color uniformity, durability and stain resistance with extraordinary ease of use.
 1. Laticrete "Spectralock Pro Grout".
 2. Color to be selected by architect after the bid date from manufacturer standards
- B. Epoxy grout is to be installed per manufacturer's instructions.

2.7 MISCELLANEOUS MATERIALS

- A. Single-Component Sealants: ASTM C 920, Type S, Grade NS, use NT (for use in joints in non-traffic areas).
- B. Two-Component Sealants: ASTM C 920, Type M, Grade P, Class 25, use T (for use in joints subject to pedestrian traffic).
- C. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred St., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.

2.8 TILE BACKING PANELS

- A. Fiber-Cement Backer Board: ASTM C1288, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Custom Building Products.
 - c. James Hardie Building Products, Inc.
 - 2. Thickness: 1/2 inch (12.7 mm) unless otherwise indicated on drawings.
- B. Install panels and treat joints in accordance with ANSI A108.11, APA guidelines, and manufacturer's written instructions for type of application indicated

2.9 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Schluter Systems L.P.
 - b. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- C. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.2 PRE-INSTALLATION CONFERENCE

- A. A pre-installation conference is required before any tiling materials are installed. This conference shall be conducted by a representative of the Architect and attended by the General Contractor and Tile Contractor. Provide at least 72 hours advance notice to participants prior to convening pre-installation conference.

- B. The pre-installation conference is intended to clarify demolition and application requirements for work to be completed before tiling operations can begin. This would include a detailed review of the specifications, plans, finish schedules and approved shop drawings, submittal data, samples and mock-ups. If this pre-installation conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all tiling areas and substantial agreement on all requirements.
- C. The following are to be accomplished during the conference:
 - 1. To review all requirements listed in the specifications and resolve any questions or conflicts that may arise.
 - 2. To establish trade-related job schedules.
 - 3. To establish tiling schedule and work methods that will prevent progress of other trades.
 - 4. Require that all surface preparations and conditions be complete prior to installing tile work.
 - 5. To establish those areas on the job site that will be designated as work and storage areas for tiling operations.
 - 6. To establish acceptable methods of protecting the finished tile surfaces if any trades must travel across or work on, above or around any areas of the finished tile work.
- D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-installation conference. This report shall be made a part of the project record and copies furnished to the General Contractor and the Owner.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Setting beds:
 - 1. Floor tile: Thinset.
 - 2. Wall tile: Thinset.
- D. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.
- F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
 - 1. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- G. Lay out tile wainscots to next full tile beyond dimensions indicated.
- H. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, or if not indicated, at spacing and locations recommended in TCA "Handbook for Ceramic Tile Installation", and approved by Architect.

1. Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.

- I. Grout tile to comply with referenced installation standards, using grout materials indicated.

3.4 FLOOR INSTALLATION METHODS

- A. Porcelain Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Concrete Subfloors, Interior: TCA F113 with isolation membrane equal to Nobleseal CIS.

- B. Grout:

1. High Performance Epoxy grout is to be installed per manufacturer's instructions.

- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.

- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood or other flooring which finishes flush with top of tile.

3.5 WALL TILE INSTALLATION METHODS

- A. Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Solid Backing, Interior: TCA W221 in wet areas and W213 or W223 25

- a. applicable in other areas.

- B. Grout:

1. High Performance Epoxy grout is to be installed per manufacturer's instructions.

3.6 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Unglazed tile shall be cleaned with non-acid solutions only recommended by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of tile cleaning. Flush surface with clean water after cleaning.

- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

- C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

- D. Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is completed. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Tile Flooring: Furnish not less than one box for each type, color, pattern and size installed.

END OF SECTION

SECTION 09510 - ACOUSTICAL CEILINGS

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 SUMMARY

- A. Extent of acoustical ceilings specified in this section include the following:
 - 1. Acoustical lay-in panel ceilings in an exposed suspended metal grid system.

SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
 - 1. Full size sample of each acoustical panel type, pattern and color.
 - 2. Set of 12" long samples of exposed runners and moldings for each color and system type required.
- B. Certificates: Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustical 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 inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - 2. Flame Spread: 25 or less.
 - 3. Smoke Developed: 50 or less.
- B. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Coordination of Work: Coordinate layout and installation of acoustical 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).
- D. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

- A. Space Enclosures: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete

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ACOUSTICAL CEILINGS
09510-1

and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

USG Interiors, LLC. (Basis of Design) | www.usg.com | Ph: 1.800.950.3839

1. Certainteed Corporation | www.certainteed.com | Ph: 1.800.233.8990
2. Armstrong World Industries Inc. | www.armstrongceilings.com | Ph: 877.276.7876

- B. Equal products of other manufacturers may be used in the work provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 GENERAL ACOUSTICAL CEILING TILE UNITS

- A. Standard for Acoustical Ceiling Tile Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).

1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.

- B. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).

- C. Colors, Textures and Patterns: Provide products to match appearance characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.3 ACOUSTICAL TILES

A. Acoustical Panel Type: Vinyl Covered Ceiling Panels

1. USG "Sheetrock Brand Clean Room Lay-In Gypsum Panels".
2. Classification: Provide ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type XX, mineral based with membrane faced overlay. Vinyl face, back and sides covered gypsum ceiling panels.
 - b. Form: Not Applicable
 - c. Pattern: Smooth
3. Color: Flat White 050.
4. LR: Not less than 0.77
5. NRC: Not less than: N/A
6. CAC: Not less than 35
7. Edge / Joint Detail:
 - a. Square (Typical if not indicated on drawings).
 - b. SLT Beveled Reveal (Only if indicated on drawings).
8. Panel Thickness: 1/2 inch (12.7 mm).

9. Modular Size: 24 by 24 inches (610 by 610 mm).
10. Recycled Content: 80%.
11. Panel Features: Washable, scrubbable, soil and impact resistant finish. Meets USDA/FSIS guidelines for use in food processing areas.
12. Clean room performance: Acceptable in applications up to Class 100 Clean rooms.
13. ClimaPlus™ 30 year limited system warranty. Contains a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew. Includes sag resistance performance.
14. Suspension Grid/Width: USG Donn ZXLA; 15/16".

B. Acoustical Panel Type: Lay-In Acoustical Ceiling Panels

1. USG "Radar" Acoustical Panels
2. Classification: Provide ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type III, mineral base with painted finish
 - b. Form: 2, water felted.
 - c. Pattern: Perforated, small holes and light texture.
3. Color: Flat White 050.
4. LR: Not less than 0.84
5. NRC: Not less than 0.45
6. CAC: Not less than 33
7. Edge / Joint Detail:
 - a. #2110 - SQ Square (Typical if not indicated on drawings).
8. Panel Thickness: 5/8 inch (15.8mm).
9. Modular Size: 24 by 24 inches (600 by 600 mm).
10. Recycled Content: Up to 59%.
11. Panel Features:
 - a. Biobased product that is USDA certified.
 - b. Abuse Resistant, high durability and can be cleaned easily with a soft brush & vacuummed.
12. ClimaPlus™ 30 year limited system warranty. Contains a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew. Includes sag resistance performance.
13. Suspension Grid/Width: USG Donn DX; 15/16" (24mm).

2.4 METAL SUSPENSION SYSTEMS

A. USG Donn Brand DX/DXL 15/16" Acoustical Suspension System

1. Narrow Face, Capped, Double Web, Cold Rolled Steel Suspension System: Main and Cross Tees as defined by ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish
2. Structural Classification: Intermediate Duty.
3. Tee Profile: Narrow Face 15/16" (22mm) wide.
4. Color: White

2.5 SEALANT

- A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
- B. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. BA-98; Pecora Corp.
 - 2. Tremco Acoustical Sealant; Tremco
 - 3. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to schedule bid opening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Coordinate ceiling layout with lighting layout. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.2 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 and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
- C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members.
 - 1. Locate hangers within 6" inches from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
 - 2. Locate hangers on all 4 corners of the ceiling grid where a projector is installed
- D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperature. DO NOT HANG WORK DUCT WORK.
- E. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.
- F. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
- G. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.
- H. Screw-attached moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.
- I. Install acoustical panels in coordination with suspension system with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

- J. Install hold-down clips on panels, within 10'-0" of exterior door openings, where panels are other than horizontal, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.3 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Ceiling Tile: Furnish not less than one box for each type, color, pattern and size installed.

END OF SECTION

SECTION 09650 - RUBBER BASE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of rubber base is shown on drawings and in schedules.

1.2 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of rubber base as produced by a single manufacturer, including recommended, adhesives.
 - 1. Wherever possible, provide required rubber base produced by a single manufacturer.

1.3 SUBMITTALS

- A. Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of rubber base.
- B. Samples: Submit, for verification purposes, samples of each type, color, and pattern of rubber base,

1.4 JOB CONDITIONS

- A. Maintain minimum temperature of 65°F in spaces to receive rubber base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store rubber base materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55°F in areas where work is completed.
- B. Install after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Armstrong World Industries, Inc.
 - 2. Flexco
 - 3. Roppe Corporation
- B. Equal products of other manufacturers may be used in the work provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Colors and Patterns: As selected by Architect from manufacturer's standards.
- B. Wall Base: Provide rubber base complying with FS SS-W-40, Type II, with matching end stops and pre-formed or molded corner units and as follows:
 - 1. Height: 4"
 - 2. Thickness: 1/8"
 - 3. Style: Standard Top-Set Cove
 - 4. Finish: Matte

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed

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RUBBER BASE
09650-1

corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base 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.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.2 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.
- B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.
- C. Apply polish and buff, with type of polish, number of coats, and buffing procedures in compliance with flooring manufacturer's instructions.

END OF SECTION

SECTION 09651 – LUXURY VINYL TILE FLOORING (LVT)

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Luxury Vinyl Tile flooring and accessories as indicated on drawings and in schedules.

1.2 RELATED REQUIREMENTS

- A. Section 09650 – Rubber Base.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of Luxury Vinyl Tile flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants and leveling compounds.
 - 1. Wherever possible, provide required Luxury Vinyl Tile flooring and accessories produced by a single manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of Luxury Vinyl Tile flooring and accessory.
- B. Samples: Submit, for verification purposes, samples of each type, color, and pattern of Luxury Vinyl Tile, including accessories, required, indicating full range of color and pattern variation.

1.5 JOB CONDITIONS

- A. Store Luxury Vinyl Tile flooring products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by the manufacture, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- B. Maintain minimum temperature of 65°F in spaces to receive Luxury Vinyl Plank Tile flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store Luxury Vinyl Tile materials in spaces where they will be installed for at least 48 hours before beginning installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacture but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- E. Install Luxury Vinyl Tile flooring and accessories after other finishing operations, including painting, have been completed. Do not install Luxury Vinyl Tile Flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Mannington Commercial, 1844 U.S. Highway 41 S.E. Calhoun, GA 30701; PH: 800.241.2262; www.manningtoncommercial.com.
 - 2. Patcraft *CMYK or Stratified*; P.O. Box 2128, Dalton, GA 30722; PH: 334.462.9547; www.patcraft.com.
 - 3. Tarkett (Basis of Design) ; 2600 Aurora Hills, Solon, OH 44139; PH: 850.510.2721; www.tarkett.com
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. LVT: "Event" Series
 - 1. Construction High Performance Luxury Vinyl Tile flooring
 - 2. Class / ASTM F 1700 Class III Printed Film Vinyl Tile, Type B (embossed)
 - 3. Wear layer Thickness 20 mil or 0.020" (0.5 mm) Quantum Guard Elite
 - 4. Overall Thickness 4.0 mm or nominal
 - 5. Nominal Dimensions: 4" wide x 36" long
 - 6. Backing Class Commercial Grade
 - 7. Installation Glue Down
 - 8. Slip Resistance / ASTM D 2047 >0.65 (wet/dry)
 - 9. Warranty: 20 year limited commercial wear warranty.
 - 10. Colors as selected by the Owner.
- B. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- C. Leveling Compound: ProSpec Feather Edge, premium, polymer modified, rapid setting, trowelable underlayment that results in a very smooth, ultra thin finish or as recommended by the flooring manufacture.
- D. Surfaces must be solid, completely clean, free of oil, gypsum compounds, wax, grease, sealers, curing compounds, asphalt, paint, dirt, loose surface material and any contaminants that act as a bond breaker. Weak concrete surfaces must be cleaned down to solid sound concrete by mechanical means. Acid etching or chemical cleaning is not acceptable. Remove all dirt by vacuuming. All subfloors must be clean, dry and at least 40° F (4° C) prior to applying ProSpec Feather Edge.
- E. Installation: ProSpec Feather Edge will accept standard floor coverings such as VCT, vinyl sheet goods, tile and carpeting in approximately 15-30 minutes after placement.
- F. Materials: Extruded rubber accessories as required (i.e. nosings, reducer strip.)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufactures written instructions to ensure adhesion of Luxury Vinyl Tile Flooring.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

4. Prepare Substrates according to ASTM F 710 including the following:
 - a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - i. Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
 - or**
 - ii. Perform relative humidity test using in situ probes, ASTM F 2170. Results must not exceed 80%.
 - b. A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
 - c. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
- B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Floor covering shall not be installed over expansion joints.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. LVT that shows peaks from debris on floor will be replaced with same lot number tile (not from maintenance stock).

3.3 FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient tile flooring.
 1. Install with manufacturer's adhesive specified for the site conditions and follow adhesive label for proper use.
 2. Follow manufacturer's recommendation and lay tiles so graining follows the same direction.
 3. Roll the flooring in both directions using a 100 pound three-section roller.
- B. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, from wall to wall and under all casework or other fixed equipment. Where construction joints in concrete slab occur, lay tile joint with construction joint.
- C. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
 1. Lay each color of tile with grain running in one direction.
- D. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.
- E. Accessories: Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base 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.

- F. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- E. Cover resilient products until Substantial Completion.
- F. Wait 72 hours after installation before performing initial cleaning.
- G. A regular maintenance program must be started after the initial cleaning.

3.5 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Flooring: Furnish not less than two box for each lot number, type, color, pattern and size installed.
 - 2. Do not use extra stock during warranty period to replace construction materials that are defective.

END OF SECTION

SECTION 09900 - PAINTING

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 DESCRIPTION OF WORK

- A. Extent of painting work is indicated on drawings and schedules, and as herein specified including accent painting.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
 - 1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatments specified under other sections of work.
- C. Work includes field painting of exposed bare and covered pipes, conduits and ducts (including color coding), and of hangers, exposed steel and iron work, and conduits and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
- F. Following categories of work are not included as part of field-applied finish work.
 - 1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, elevator entrance doors and frames, elevator equipment, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
 - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 - 3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 - 4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
- G. Following categories of work are included under other sections of these specifications.
 - 1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 - 2. Unless otherwise specified, shop priming of fabricated components such as shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
- H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples: Prior to beginning work, Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's re- view of color and texture only.
- C. Provide a listing of material and application for each coat of each finish sample. Provide a 4' x 4' sample application of each color paint for Architect's approval prior to final ordering of product. Sample application shall be applied in an inconspicuous place, satisfactory to the Architect.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1. Name or title of material.
 - 2. Fed. Spec. number, if applicable.
 - 3. Manufacturer's stock number and date of manufacturer.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 JOB CONDITIONS

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degree F and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degree F and 95 degree F, unless otherwise permitted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85% or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers are listed as acceptable substitutions to the establish minimum standards. Sherwin Williams Products are listed as the standard of product performance and quality.
 - 1. Sherwin Williams Paint Company (SW)
 - 2. Benjamin Moore and Co. (Moore).
 - 3. Pittsburgh Paints (PPG).
 - 4. Tenemec Company
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
 - 1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
 - 2. Federal Specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.
 - 3. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

PART 3 – EXECUTION

3.1 INSPECTION

- A. **Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator. If work is begun before satisfactory conditions are met, then it shall be the Applicators' responsibility for the finish surfaces conditions.**
- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 1. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 - 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting

of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

3. Contractor MUST remove ALL foreign matter/material not pertinent to new paint from all surfaces before application of any new paint. Foreign matter/material includes, but is not limited to, flaking paint, tape, tacks, nails, poster gum, adhesives of any kind etc.
 4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 2. Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid and allow to dry before painting.
- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 2. When transparent finish is required, use spar varnish for backpriming.
 3. Backprime all exposed exterior wood. Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.
 4. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.
- D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
1. Touch-up shop-applied prime coats wherever damaged or bare. Clean and touch-up with same type shop primer.
- E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. If film exists, remove film and strain paint material.

3.4 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.

1. Provide finish coats which are compatible with prime paints used.
 2. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness not less than specified thickness.
 3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
 4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 5. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 6. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
 7. Sand lightly between each succeeding enamel or varnish coat.
 8. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- D. Prime Coats: Apply prime coat where required to be painted or finished, and which has not been primed coated by others.
1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- F. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats, unless otherwise indicated.
- G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 FIELD QUALITY CONTROL

- A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:
1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.

2. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
- B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.6 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each day.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
1. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- D. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.7 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
1. Paint: Furnish not less than one gallon for each type and color, applied.

3.8 EXTERIOR PAINT SCHEDULE

A. GENERAL

1. Paint all new roof penetrations at roof areas, including roof attic ventilators and exhaust fan housings.
2. General: Provide the following paint systems for the various substrates, as indicated.

B. EXTERIOR WOODWORK

1. Painted Woodwork.
 - a. Exterior Acrylic Latex Gloss Finish.
 - i. 2 finish coats over primer with total dry film thickness of not less than 5.0 mils. Back prime all trim.
 - ii. 1st Coat: S-W Exterior Oil-Based Wood Primer, Y24W08020 (4 mils wet, 2.2 mils dry).
 - iii. 2nd Coat: S-W SuperPaint Exterior Latex Gloss Paint, A84 Series.
 - iv. 3rd Coat: S-W SuperPaint Exterior Latex Gloss Paint, A84 Series (4 mils wet, 1.5 mils dry per coat).
2. Stained Woodwork.
 - a. Acrylic Solid Color Stain.
 - i. Stained Finish: 2 Coats of stain on open grain wood.

- ii. 1st Coat: S-W Woodscapes Exterior Acrylic Solid Color Stain (200-400 sq ft/gal) @ 4-8 mills wet; 1.3-2.6 mills dry.
- iii. 2nd Coat: S-W Woodscapes Exterior Acrylic Solid Color Stain (200-400 sq ft/gal) @ 4-8 mills wet; 1.3-2.6 mills dry.

C. EXTERIOR MASONRY UNITS

- 1. Concrete / Mortar Surfaces (Pre-cast, Cast-In-Place, EIFS, Stucco, etc).
 - a. Acrylic Coating.
 - i. 1st Coat: S-W Loxon Concrete & Masonry Primer / Sealer, LX02W0050 (5.3 – 8.0 mills wet, 2.1 – 3.2 mills dry per coat).
 - ii. 2nd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series.
 - iii. 3rd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series (5.0 – 7.0 mills wet, 2.1 – 2.9 mills dry per coat).
- 2. Concrete Masonry Units (CMU).
 - a. Acrylic Coating.
 - i. 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mills wet, 8.0 - 10.5 mills dry per coat).
 - ii. 2nd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series.
 - iii. 3rd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series (5.0 – 7.0 mills wet, 2.1 – 2.9 mills dry per coat).

3.9 INTERIOR PAINT SCHEDULE

A. GENERAL

- 1. Provide the following paint systems for the various substrates, as indicated on drawings, schedules and specifications.
- 2. Paint all exposed metals (steel framing, mechanical ducts, conduit, etc.) unless otherwise indicated on drawings.
- 3. Painter shall identify all fire and smoke partitions above lay in ceilings as follows: Wording shall be "FIRE AND SMOKE BARRIERS - PROTECT ALL OPENINGS" (4" high), to be applied every 8'- 0" on center.

B. INTERIOR MASONRY UNITS

- 1. Concrete Masonry Units (CMU).
 - a. Latex Semi-Gloss Enamel Finish
 - i. 2 Finish coats over filled surface with total dry film thickness of not less than 11.4 mills.
 - ii. 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mills wet, 8.0 - 10.5 mills dry per coat).
 - iii. 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series.
 - iv. 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series (4 mills wet, 1.5 mills dry per coat).
 - v. Locations: Typical at all CMU unless otherwise indicated in the schedule.
 - b. Epoxy - Pre-Catalyzed Waterbased Semi-Gloss Finish.
 - i. 2 Finish coats over filled surface with total dry film thickness of not less than 11.4 mills.

- ii. 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mils wet, 8.0 - 10.5 mils dry per coat).
 - iii. 2nd Coat: S-W Pro Industrial® Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-01151 Series (4 mils wet, 1.4 mils dry per coat).
 - iv. 3rd Coat: S-W Pro Industrial® Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-01151 Series (4 mils wet, 1.4 mils dry per coat).
 - v. Locations: All Wet Areas in Athletic Facilities.
 - c. Epoxy – Catalyzed Waterbased EgShel Finish.
 - i. 2 Finish coats over filled surface with total dry film thickness not less than 14.0 mils.
 - ii. 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mils wet, 8.0 - 10.5 mils dry per coat).
 - iii. 2nd Coat: S-W Pro Industrial Catalyzed Waterbased Epoxy EgShel Finish, B73-360 Series.
 - iv. 3rd Coat: S-W Pro Industrial Catalyzed Waterbased Epoxy EgShel Finish, B73-360 Series (5.0 – 12.0 mils wet, 2.0 – 5.0 mils dry per coat).
 - v. Locations:
 - 1. All Showers Areas.
 - 2. Kitchens / Cafeterias / Servicing / Dining / Kitchen Storage / Dishwashing / Freezer-Coolers.
 - 3. FACS.
- 2. Existing Concrete Masonry Units (CMU).
 - a. If existing concrete block walls are covered with an enamel paint finish, the following shall be used:
 - i. 1st Coat: S-W Extreme Bond Primer, B51W00150 (3.1 mils wet, .9 mils dry).
 - ii. 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series.
 - iii. 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series (4 mils wet, 1.5 mils dry per coat) .
 - b. If the existing concrete block walls are covered with a latex paint finish, the following shall be used:
 - i. 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
 - ii. 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series.
 - iii. 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series (4 mils wet, 1.5 mils dry per coat).

C. GYPSUM DRYALL

- 1. Walls and Ceilings
 - a. Interior Acrylic Latex Semi-Gloss Finish.
 - i. 3 Coat system with dry film thickness not less than 3.8 mils.
 - ii. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
 - iii. 2nd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss Finish, B31W02651 Series.
 - iv. 3rd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss Finish, B31W02651 Series (4 mils wet, 1.5 mils dry per coat).

- v. Locations: Typical at all Gypsum Drywall Walls and Ceilings unless otherwise indicated in the schedule.
- b. Epoxy - Pre-Catalyzed Waterbased EgShel Finish.
 - i. 2 Finish coats over Primer with total dry film thickness not less than 14.0 mils.
 - ii. 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
 - iii. 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy EgShel Finish, K45-01151.
 - iv. 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy EgShel Finish, K45-01151 (2-4 mils dry per coat).
 - v. Locations: Walls and Ceilings at Showers Areas. *NOT in Shower Stalls.*
- c. (Contractor Option) Epoxy - Catalyzed Waterbased EgShel Finish.
 - i. 2 Finish coats over Primer with total dry film thickness not less than 14.0 mils.
 - ii. 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
 - iii. 2nd Coat: S-W Pro Industrial Catalyzed Waterbased Epoxy EgShel Finish, B73-360 Series.
 - iv. 3rd Coat: S-W Pro Industrial Catalyzed Waterbased Epoxy EgShel Finish, B73-360 Series (5.0 – 12.0 mils wet, 2.0 – 5.0 mils dry per coat).
 - v. Locations: Walls and Ceilings at Showers Areas. *NOT in Shower Stalls.*

D. INTERIOR WOODWORK

- 1. Painted Woodwork.
 - a. Interior Semi-Gloss Acrylic Latex with dry film thickness not less than 3.8 mils.
 - i. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
 - ii. 2nd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss Finish, B31W02651 Series.
 - iii. 3rd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss Finish, B31W02651 Series (4 mils wet, 1.5 mils dry per coat).
- 2. Stained Woodwork
 - a. Stained Varnish Rubbed Finish: 3 Finish Coats over stain plus filler on open grain wood.
 - i. 1st Coat: S-W MinWax Performance Series Tintable Interior Stain 550 VOC, (450-550 sq ft/gal) Available in 250 VOC Version.
 - ii. 2nd Coat: S-W MinWax Performance Series Fast-Dry Varnish.
 - iii. 3rd Coat: S-W MinWax Performance Series Fast-Dry Varnish (600-700 sq ft/gal) (available in Gloss, Semi-Gloss, Satin)
- 3. Wall Panels (Wood and Acoustical).
 - a. Interior Semi-Gloss Finish Acrylic Latex with dry film thickness not less than 3.8 mils.
 - i. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600(4 mils wet, 1.0 mils dry)
 - ii. 2nd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series
 - iii. 3rd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series (4 mils wet, 1.5 mils dry per coat)

END OF SECTION

SECTION 10160 - TOILET PARTITIONS

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 DESCRIPTION OF WORK

- A. Extent of toilet partitions is indicated on drawings.
- B. Types of toilet partitions and screens required include the following:
 - 1. Solid phenolic with fused surface laminate, floor-supported, overhead-braced.
- C. Toilet accessories are specified elsewhere in Division 10.

1.3 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- C. Samples: Submit full range of color samples for each type of unit required. Submit 6" square samples of each color and finish on same substrate to be used in work, for color selections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Bobrick Washroom Equipment, Inc, 200 Commerce Drive, Clifton Park NY 12065-1350; Ph.: 518.877.7444; www.bobrick.com.
 - 2. General Partitions Mfg. Corp., 1702 Peninsula Drive, Erie, PA 16505-4243; Ph.: 814.833.1154; www.generalpartitions.com.
 - 3. ASI Global Partitions; 900 Clary Connector, Eastonollee, GA 30538; Ph.: 706.827.2700; www.asi-globalpartitions.com.
 - 4. ASI Accurate Partitions; 160 Tower Drive; Burr Ridge, IL 60527; Phone: 708.442.6800; www.asi-accuratepartitions.com.
 - 5. Bradley Partitions; W142N9101 Fountain Boulevard, Menomonee Falls, WI 53051; Ph.: 1.800.272.3539; www.bradleycorp.com.
 - 6. PSiSC - A Division of CSiSC; 9031 Farrow Road, Columbia, SC 29203; Ph.: 803.252.3020 Extension 106; www.psisc.com.
 - 7. Metpar; 95 State Street, Westbury, NY 11590; Ph: 516.333.2600; www.metpar.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Materials: Doors, panels and pilasters are composed of compressed cellulose fibers impregnated with resins. The surface laminate is fused to the resin-impregnated core. All edges are machined and finished smooth with beveled edge. Material will not delaminate even under extreme conditions. Materials are non-absorbent, impact and graffiti resistant. Materials are impervious to steam, soaps and detergents and will not mildew.
- C. Panels: Shall be 1/2" thick with eased edges uniformly machined to a 1/16" radius. Panels are 58" high and anchored to walls with 18 gauge stainless steel continuous brackets and continuous stainless steel brackets at panel to pilaster locations.
- D. Doors: Shall be 3/4" thick with eased edges uniformly machined to a 1/16" radius. Doors are 58" high and mounted to pilasters with continuous stainless steel surface mounted hinge. Pre-threaded inserts are to be provided for all door hardware. Each door is furnished with one coat hook/bumper, slide latches, stops and pulls (for outswing doors) to be made of stainless steel. Door hardware shall allow for lift up emergency access.
- E. Pilasters: Shall be 3/4" thick with eased edges uniformly machined to a 1/16" radius. Pilasters are 83" high (or as indicated on the drawings) and anchored to panels and walls with continuous stainless steel brackets. The pilasters contain no less than two level adjusting bolts on the bottom and attach to the floor with two 3/4" expansion bolts and are braced at the top with aluminum headrail.
- F. Stainless Steel Pilaster Shoes: Shall be 3" high, and constructed of 20-gauge stainless steel. Pilaster shoes are bolted onto pilaster with stainless steel, tamper resistant sex bolts and screws.
- G. Latches and Keepers: Shall be fabricated from stainless steel with a satin finish. Latch is mounted onto door with 1/4" stainless steel torx head bolts pre-threaded inserts and acts as the stop for inswing doors. Keepers are mounted on the pilasters with stainless steel toex head screws.
- H. Headrail: Shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with bright-dip anodized finish. Headrail is anti-grip and attaches to the top of the pilasters with stainless steel, tamper resistant torx screws. Headrail is attached to the adjacent wall construction with a stainless steel headrail bracket.
- I. Headrail Bracket: Shall be made of 16 gauge stainless steel and is attached to the adjacent wall construction with #14 x 1 1/2" stainless steel phillips-head screws and plastic anchors.
- J. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel with pinhead, torx screws and bolts.

2.3 FABRICATION

- A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.
- B. Door Dimensions: Unless otherwise indicated, furnish 24" wide inswinging doors for ordinary toilet stalls and 32" wide (clear opening) outswinging doors at stalls equipped for use by handicapped.
- C. Overhead-Braced Partitions: Furnish stainless steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.
- D. Floor-Supported Partitions: furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

- E. Floor-Supported Over-Head Braced Screens: Furnish pilasters not less than 3/4" in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.
- F. Accessories: Furnish units with chromium-plated finish, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's recommended procedures and installation sequences. Install partitions rigid, straight, plumb, and level.
- B. Provide clearances of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with full length stainless steel brackets. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.
- C. Overhead-Braced Partitions and Screens: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.
- D. Floor-Supported Partitions: Set pilaster units with anchorages having not less than 2" penetration into structural floor, unless otherwise recommended by partition manufacturer. Level, plumb and tighten installation with devices furnished. Hang doors and adjust so that tops of doors are level with tops partition when doors are in closed position.
- E. Screens: Attach with concealed anchoring devices, as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.
- F. Accessories: Mount accessories to partition units in accordance with manufacturer's instructions.

3.2 ADJUST AND CLEAN

- A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 10410 - IDENTIFYING DEVICES

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 DESCRIPTION OF WORK

- A. Types of identifying devices specified in this section include the following:
 - 1. Room Signs (See Door Schedule)
 - 2. Plaque
 - 3. Metal Signage
 - 4. Project Sign
- B. Note to the Contractor: If the Contract Sum (as awarded) is \$100,000.00 or more, the Contractor shall furnish and erect a project sign and interior plaques as shown in "Detail of Project Sign" (DCM Form C-15) and "Plaque Detail" bound in the Project Manual at the end of "General Conditions". The project sign shall be erected in a prominent location selected by the Architect and Owner and shall be maintained in good condition until completion of Work.
- C. Extent of signs and plaque is indicated on the drawings.

1.3 QUALITY ASSURANCE

- A. Drawings and Specifications are based on one manufacturer's standard products. Another standard system of a similar and equivalent nature may be acceptable when the differences do not materially detract from the design concept or intended performance as judged solely by the Architect.
- B. **General Contractor is responsible for verifying signage requirements and correct wording, names etc. with Owner and Architect before ordering.**

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for each type of device. Include large scale sections of typical members and other components. Provide dimensioned elevations. Show anchorages, grounds and reinforcement and indicate finishes.

PART 2 - PRODUCTS

2.1 ROOM SIGNS

- A. MANUFACTURER:
 - 1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. ASI Sign Systems, Inc., 8181 Jetstar Drive, Suite 100, Irving, TX 75063;
www.asisignage.com; 1-800-274-7732
 - b. Best Sign Systems, www.bestsigns.com; 1202 N. Park Avenue, Montrose, CO 81401-3171, Phone (970) 249-2378 or 1-800-235-2378; Fax (970) 249-0223
 - c. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699-3342
 - d. Bayuk Graphic Systems, Inc., www.bayukgraphics.com; 5005 Old Lincoln Highway Parkesburg, PA 19365; Phone: (717)-442-0274; Fax: (717)-442-1289
 - e. Mohawk Sign Systems; www.mohawksign.com; 5 Dandrea Dr, Amsterdam, NY 12010; Ph. 518.842.5303.

2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

1. Provide 6" x 8" high laminated plastic with raised lettering complying with the Americans with Disabilities Act (ADA).
2. Color to be selected by the Architect after bid date from manufacturer standards.
3. Use International Symbols of accessibility for identifying facilities as accessible.
4. Letters and numerals shall be raised 1/32 in (0.8 mm) minimum, upper case, sans serif or simple serif type and shall be accompanied with Grade 2 Braille.
5. Raised characters shall be at least 5/8 in (16 mm) high, but no higher than 2 in (50 mm).
6. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6 in (152 mm) minimum in height.
7. **See Door Schedule. If not shown provide 20 letter characters per room sign.**
8. **The Supplier will be required to meet with the Owner for exact wording for all room signs before preparation of the shop drawing submittal to the Architect for approval.)**
9. Tactile characters on signs shall be located 48 inches (1220 mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches (1525 mm) maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.
 - a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.
 - b. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf.
 - c. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.
 - d. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
 - e. Signs containing tactile characters shall be located so that a clear floor space of 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position. Mounting devices shall be concealed.

2.2 METAL LETTERS & LOGOS

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525; (708) 469-7178; impact@impactsigns.com
 - b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699-3342
 - c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
 - d. A.R.K. Ramos Architectural Signage, www.arkramos.com; 1321 S. Walker Ave., Oklahoma City, OK; Ph. 800.725.7266

2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Provide standard cast aluminum letters for exterior architectural signage shown on drawings and as follows:
2. Building Signage: Provide full size sample prior to manufacture of all letters.
 - a. Mounting shall be projected mount without collars set in adhesive.
 - b. Color shall be anodized aluminum.
 - c. Style of letter shall be as follows:
 - I. Height: 2' High - Upper Case.
 - II. Depth: 1 ¼" Deep – Upper Case.
 - III. Font: Arial Bold
 - IV. Letters to read as indicated on drawings.
3. LOGOS: Provide standard cast aluminum logos as shown on drawings.
 - a. Colors as selected by Architect and Owner after bid.
 - b. Mounting as indicated on drawings.

2.3 PLAQUE

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525; (708) 469-7178; impact@impactsigns.com
 - b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699-3342
 - c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
 - d. A.R.K. Ramos Architectural Signage, www.arkramos.com; 1321 S. Walker Ave., Oklahoma City, OK; Ph. 800.725.7266
2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Refer to *Detail Of Plaque (ABC Form C-16, August 2001)* at the front end of the project manual.
2. Size: 24" high x 24" wide.
3. Cast aluminum with bronze finish of standard alloy, hand tooled and chased.
4. Raised letters and border.
5. Satin finish.
6. Background pebbled finish and oxidized to a darker finish.
7. Casting to be free of pits and holes, square and true with no warping.
8. Border style to be single line.
9. Letters to be flat face classic design.

10. Furnish Rubbing to Architect for approval.

C. Wording on the plaque shall read as follows.

<p>A New Community Center at Knox Street Park for the City of Troy Troy, Alabama</p> <p>TROY CITY COUNCIL MRS. SHARON McSWAIN, DISTRICT 1 MR. GREG MEEKS, DISTRICT 2 MR. MAX DAVIS, DISTRICT 3 MRS. STEPHANIE BAKER, DISTRICT 4 MRS. WANDA HOWARD-MURPHY, DISTRICT 5</p> <p>HONORABLE JASON A. REEVES, MAYOR</p> <p>SUPERVISED BY</p> <p>STATE OF ALABAMA</p> <p>LATHAN MCKEE, ARCHITECTS (COMPANY NAME), CONTRACTOR</p>
--

2.4 FABRICATION

- A. General: Fabricate signs to comply with requirements indicated including, dimensions, design details, quality, thickness and finish of materials. Use materials and shapes of sufficient thickness, with reinforcing, if needed, to produce sufficient flatness, free of "oil canning", and to impart sufficient strength for size, design and application indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units plumb and level, in locations and with mounting shown. Securely attach to the supporting structure with concealed fasteners, in accordance with the manufacturer's installation instructions.

3.2 CLEANING AND PROTECTION

- A. At completion of the installation, clean surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 10440 - FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire Extinguishers.
 - 2. Extinguisher cabinets.
 - 3. Accessories.
- B. Related Requirements:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International (ASTM):
 - a. ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
 - 2. International Code Council (ICC):
 - a. International Building Code (IBC) - Current Edition.
 - 3. Intertek Testing Services/Warnock-Hersey International (ITS/WHI)
 - 4. National Fire Protection Association (NFPA):
 - a. NFPA 10-2010, Standard for Portable Fire Extinguishers: For criteria covering installations for Class A, B, C, D, and K hazards as well as the selection, inspection, maintenance, recharging, and testing of portable fire extinguishing equipment.
 - b. NFPA 70-2011, National Electrical Code.
 - 5. Underwriters Laboratories, Inc. (UL)
 - 6. United States Code (USC):
 - a. Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008: For restrictions relating to cabinet projections in corridors.

1.3 ACTION SUBMITTALS

- A. Submit in accordance with Section 01600:
 - 1. Product Data:
 - a. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.
 - b. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.
 - c. Installation instructions for each product specified.
 - 2. Shop Drawings:
 - a. Small-scale plans showing locations of fire extinguisher cabinets and individual fire extinguishers.
 - b. Schedules showing each type of cabinet and extinguisher to ensure proper fit and function.
 - c. Indicate installation procedures and accessories required for a complete installation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

FIRE EXTINGUISHERS AND ACCESSORIES
10440-1

3. Samples:

- a. Extinguisher Cabinet Door and Trim Finishes: For each type of exposed finish required, prepared on samples of size indicated below:
 - i. Size: 6 inches (150 mm) square.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Comply with standards referenced in Article 1.02 - REFERENCES.
- B. Provide fire extinguishers, cabinets and accessories produced by a single manufacturer.
- C. Provide fire extinguishers of type approved by UL, State Fire Marshal's Office, and local regulatory agencies, if any.
- D. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle fire protection specialties and related materials using means and methods that will prevent damage, deterioration, or loss.
 - 1. Deliver components in manufacturer's original packaging, properly labeled for identification.

1.7 WARRANTY

- A. All Fire Protection Products (except fire extinguishers) carry a one year warranty after date of shipment against defects in materials or workmanship. Fire extinguishers carry a longer warranty. We will replace or repair any product found defective within this period. No other warranty expressed or implied is valid. Manufacturer's warranty, terms and conditions apply in all cases. Please see complete warranty on our website for more details.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SPECIALTIES MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. J. L. Industries, Inc., a division of Activar Construction Products Group; 9702 Newton Av S Bloomington, MN 55431; (800) 554-6077, (952) 835-6850, (952) 835-2218 (FAX); SALES@ACTIVARCPG.COM; www.activarcpg.com
 - 2. Larsen's Manufacturing Company
 - 3. Modern Metal Products
- B. Substitutions: Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 FIRE EXTINGUISHERS

- A. Multi-Purpose Chemical Type: Extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.
 - 1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.
 - 2. Finish: Factory powder-coated; Red.
 - 3. Effectiveness (Rating): Class A, B, and C fires.
 - 4. Model Identification and UL Rating: Cosmic **10E; 4A-80BC**.
 - 5. "Start Up Tags" for each fire extinguisher must be provided and approved by Local Fire

Department before Final Inspection.

- B. Class K Wet Chemical Type: Extinguisher unit containing a low "pH" potassium acetate solution.
 - 1. Construction: Stainless steel cylinder with protective nozzle tip orifice seal and nonmetallic nozzle tip finger guard, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
 - 2. Effectiveness (Rating): Class K fires.
 - 3. Model Identification and and UL Rating: **25; Class K**. Capacity: 2.5 gal.

2.3 EXTINGUISHER CABINETS

- A. Cabinet with Steel Trim and Door:
 - 1. **Ambassador Series, Model 1017F10** at Non-Fire Rated Walls.
- B. Cabinet Style: **Semi-recessed**.
 - 1. Tub: Cold-rolled steel.
 - a. Finish: Factory-applied powder coat paint finish.
 - i. To be selected by Architect after bid date from manufacturer Standard Colors.
 - 2. Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated handle with roller catch.
 - a. Finish: Factory-applied powder coat paint finish.
 - i. To be selected by Architect after bid date from manufacturer Standard Colors.
 - 3. Trim Style and Depth: Cabinets located in corridors shall not protrude into the hall way more than 2 1/2".
 - a. Semi-Recessed Cabinet:
 - i. Rolled Edge: 2-1/2 inch (63.50 mm).
 - b. Trim Dimensions: 1-3/4 inch (44.45 mm) face trim on frame and 1-1/4 inch (31.75 mm) face trim on door.
- C. Fire-Rating: Provide Fire-Rated cabinets for 1-hour and 2-hour combustible and noncombustible wall systems as required.

2.4 CABINET DOOR STYLES, GLAZING TYPES, AND ADDITIONAL OPTIONS

- A. Door Style:
 - 1. Style F: Full glazing; with pull handle.
- B. Door Glazing:
 - 1. Type 10: Clear acrylic.
- C. Additional Options:
 - 1. Cabinet Lettering:
 - a. Text: FIRE EXTINGUISHER.
 - b. Color(s): [Red] [Black] [White]. To be selected by Architect after bid date.

2.5 SOURCE QUALITY CONTROL

- A. Ship extinguishers to the Project site fully charged, EXCEPT those which contain water as an extinguishing agent, if any.
- B. Obtain Fire Extinguishers and Fire Extinguisher Brackets from same manufacturer to ensure compatibility.

PART 3 - EXECUTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

FIRE EXTINGUISHERS AND ACCESSORIES
10440-3

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed and blocking where surface mounted cabinets will be installed.
 - 1. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
 - 3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
- B. Cabinet Lettering:
 - 1. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk screen process. Provide lettering on door as indicated, or if not indicated, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

3.3 FIELD QUALITY CONTROL

- A. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL

- 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 RELATED DOCUMENTS

- A. Section 06100, Rough Framing for Blocking

1.3 DESCRIPTION OF WORK

- B. Extent of each type of toilet accessory is indicated on drawings and schedules.
- C. **NOTE: Prior to placing any orders for items within this section, the General Contractor is responsible for verifying all toilet accessories with the Owner. Should the owner choose to provide/supply any of these toilet accessories, the General Contractor shall issue a deductive Change Order for material only. The General Contractor will maintain responsibility for installation.**
- D. Toilet Accessories **Furnished and Installed by the Owner and Contractor** as follows:
 - 1. Toilet Tissue Dispensers-**Provided by Owner**
 - 2. Paper Towel Dispensers- **Provided by Owner**
 - 3. Grab Bars -**By Contractor-Contractor Installed**
 - 4. Mirror Units – **By Contractor- Contractor Installed**

1.4 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 other- wise acceptable to Architect.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function.
 - 1. Toilet Tissue Dispensers:
 - a. Roll Type: (One each water closet)
 - b. Approved Products:
 - i. Bradley #5425
 - ASI #0040
 - 2. Grab Bars:
 - a. Where shown on Plans with Safety-Grip Finish.
 - b. Approved Products:
 - i. Bradley Corporation #8122

- ii. Series ASI #3200P
 - iii. Bobrick #B6806.99
- 3. Mirror Units:
 - a. 18" x 36" One over each lavatory
 - b. 24" x 48" One at each Gang Toilet (if applicable)
 - c. Approved Products:
 - i. Bradley #780
 - ii. Bobrick #B290
 - iii. ASI #0600
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.
- B. Mirror Units: Mirror glass shall be FS DD-G-451, Type I, Class I, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411. Mirror shall be provided in stainless steel frames.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 FABRICATION

- A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; in obtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project.
- B. Surface Mounted Toilet Accessories General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units in accordance with manufacturer's 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.

3.2 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 labels and protective coatings.

END OF SECTION

SECTION 12304 - LAMINATE CLAD CASEWORK

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 work of this section.

1.2 WORK INCLUDED

- A. The extent of laminate clad casework as shown on the drawings.
- B. The work includes the fabrication and installation of laminate clad casework components of base cabinets, wall cabinets, tall cabinets, shelf units, cubbies and related countertops and other units as indicated.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Sinks and Service Fixtures: Furnished and installed under Mechanical and Electrical Divisions 15 and 16.
- B. Base Molding: Furnished and installed under Finishes Division 9.

1.4 QUALITY ASSURANCE

- A. Provide laminate clad casework and countertops furnished by the same supplier for single responsibility and integration with other building trades.
- B. Manufacturers shall show evidence of at least five (5) years experience and installations for similar types of projects.
- C. Millwork must conform to design quality of materials, workmanship and function of casework specified and shown on drawings.

1.5 SUBMITTALS

- A. Product Data: In addition to the general conditions as relates to prior approvals, submittals of manufacturer's data, installation instructions and samples are required upon architect's request.
- B. Samples:
 - 1. Submit 2, 2" x 3" samples of casework manufacturer's standard decorative laminate colors, patterns and textures for exposed and semi-exposed materials for architect's selection.
 - 2. Samples will be reviewed by architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the contractor.
 - 3. Submit one full-size sample base cabinet unit with hardware, doors and drawers, without countertop.
 - 4. Submit one full-size sample wall cabinet unit complete with hardware, doors, and adjustable shelves.
 - 5. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
 - 6. Remove sample units from the premises when directed by the architect.
- C. Shop Drawings:
 - 1. Submit shop drawings for laminate clad casework and counter- tops showing layout, elevations, ends, cross-sections, service run spaces, and location of services. Show details and location of anchorages.
 - 2. Include layout of units with relation to surrounding walls, doors, windows, and other building components.

3. Coordinate shop drawings with other work involved.

1.6 PRODUCT HANDLING

- A. Deliver laminate clad casework and countertops only after wet operations in building are completed.
- B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.
- C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.7 JOB CONDITIONS

- A. Humidity and Temperature Controls:
 1. Advise contractor of requirements for maintaining heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.

1.8 WARRANTY

- A. All materials and workmanship covered by the section will carry a one (1) year warranty from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERES

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 1. Case Systems- Midland, MI. (Basis of Design)
 2. TMI Systems - Dickson, N.D.
 3. L.S.I.
 4. Stevens Industries - Teutopolis, IL.
 5. Cabinets by Design, LLC; 770.418.1200
 6. PR Bean Company, LLC; 812.254.3761
 7. Advanced Cabinet Systems (ACS); 765.677.8000
 8. Varner Woodworks, Montgomery, AL.

2.2 MATERIALS

- A. Definitions: Identification of casework parts by surface visibility.
 1. Unit Body Open Interiors: Any storage unit surface without solid door or drawer fronts and units with glass sliding or glass framed doors.
 2. Unit Body Closed Interiors: Any storage unit surface behind solid door or drawer fronts.
 3. Unit Body Exposed Side: Any storage unit exterior side surface is visible.
 4. Concealed Surfaces: Any surface not normally visible after installation.

2.3 CORE MATERIALS

- A. Particleboard: Minimum density 45 lb. western particleboard of fir or pine meeting or exceeding ANSI A 208 1-1979, 1-M-3 requirements. Thickness used are 1/4", 1/2", 3/4" and 1". (Thickness of particleboard excluding skins).
- B. Hardboard: Prefinished hardboard in 1/4" thickness meeting or exceeding commercial standards CS-251.
- C. Plywood: Shall be 9-ply hardwood plywood.

2.4 DECORATIVE LAMINATES

- A. High pressure decorative laminate GP50 (.050), NEMA Test LD-3 - 1985.
- B. Laminate shall be counter balanced.
- C. Laminate Color Selection(s):
 - 1. Colors for countertop grades GP50, GP38, PF42 and PF30 shall be selected from Wilsonart's standard solid and pattern offering. A maximum of five (5) colors per project.
 - 2. Colors for cabinet surfaces grade GP28 shall be selected from Wilsonart's standard solid and pattern offering. A maximum of one (1) color to be selected per unit face and five (5) colors per project.
 - 3. Melamine colors shall be light beige or dove grey. One color only per project.
 - 4. Colors: To be selected by architect after bid date / during submittal phase of project.

2.5 PLASTIC EDGING

- A. 1mm PVC hot melt glue applied.

2.6 METAL PARTS

- A. Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and powder painted in light beige, sienna brown, dove grey or black colors.

2.7 CABINETS HARDWARE

- A. Hinges: Shall be five knuckle, 2-3/4 inch, overlay type, hospital tip, .095 inch thick steel. Hinges shall have a minimum of eight (8) edge and leaf fastenings. Doors 48 inches and over in height shall have three (3) hinges per door. Available in light beige, sienna brown, dove grey, black colors, or brushed chrome finish. Magnetic door catches are required with this hinge and shall be magnetic type with a minimum ten (10) pound pull, attached with screws and slotted for adjustment.
- B. Pulls: Door and drawer fronts shall be a semi-flush ABS plastic recessed and fastened with glue and screws. Available in light beige, sienna brown, dove grey or black colors.
- C. Drawer Slides: Shall be Blum bottom mount style No. BS 230E with epoxy finish. Slides will have a 100 pound load rating at full extension and a built-in, positive stop both directions. Slides shall have a life time warranty as offered by the slide manufacturer.
- D. Adjustable Shelf Supports: Shall be heavy-duty to support two hundred (200) pounds, self-locking nylon, to fit 32mm pre-drilled holes in cabinet ends and vertical partitions. The self supports shall have two (2) pins 5mm in diameter, to prevent the shelf support from rotating and tipping. Available for 3/4 inch or 1 inch thick shelves.
- E. Locks:
 - 1. Door and Drawer Locks: Shall be National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys.
 - 2. Locks for sliding 3/4" doors shall be disc type plunger lock, sliding door type with strike locks for sliding glass doors shall be a ratchet type sliding showcase lock. Install locks on all teacher's cabinets.
 - 3. Chain bolts shall be 3 inches long, shall have a 18 inch pull and an angle strike to secure inactive door on cabinets over 72 inches in height. Elbow catches shall be used on inactive doors up to and including 72 inches in height.
- F. Coat Rods: Shall be 1-1/4 inch, 14 gauge chrome plated steel.
- G. Mirrors: Shall be 1/4 inch thick polished mirror plate.
- H. Computer Grommets: Shall be 2 1/2 inch dia. plastic insert and cover to be located at each computer station.

2.8 FABRICATION

- A. Fabricate laminate clad casework to dimensions, profiles and details shown.
- B. Cabinet Joinery: Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels at each joint for twenty- four (24) inch deep cabinets and a minimum of four (4) dowels at each joint for twelve (12) inch deep cabinets. All dowels are to be industrial grade hardwood laterally fluted, with chamfered ends and a minimum diameter of ten (10) millimeters. Internal cabinet components such as fixed horizontals, rails and verticals are to be doweled in place. Dowels are to be securely glued and cabinets clamped under pressure during assembly to assure secure joints and cabinets and squareness.
- C. Unit Door and Drawer Fronts:
 - 1. Shall be 3/4 inch thick particleboard and laminate with high pressure decorative laminate GP28 color as selected on the exposed surface and high pressure laminate cabinet liner CL20 on the interior surface light beige or dove grey color.
 - 2. All edges shall be finished with 3mm PVC in light beige, sienna brown, dove grey or black color.
 - 3. Framed glass insert doors shall be 1/4 inch thick plate glass trimmed with extruded PVC plastic in light beige, sienna brown, dove grey or black color only.
 - 4. Double doors shall be used on all cabinets in excess of 24 inches in width.
- D. Unit Body Open Interiors:
 - 1. Exposed cabinet sides shall be 3/4 inch thick particleboard laminated on the exterior with high pressure decorative laminate GP28 in color as selected and balanced with high pressure cabinet liner CL20 in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.
 - 2. Unexposed cabinet sides shall be 3/4 inch thick particleboard laminated both sides with melamine in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.
 - 3. Unit top or subtop shall be 3/4 inch thick particleboard laminated both sides with melamine and front edge with 1mm PVC to match the door and drawer front edge color. All subtops shall be full depth.
 - 4. Bottom of base and wardrobe units shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color.
 - 5. Fixed intermediates shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. An inter- mediate will be provided on all units over 36 inches wide.
 - 6. Standard unit backs shall be 1/2 inch thick prefinished particleboard. Color to match interior. Exposed back on fixed or movable cabinet to be 3/4 inch thick particleboard laminated with CL20 on the interior to match melamine color and GP28 on the exterior as selected.
 - 7. Adjustable shelves shall be 3/4 inch thick particleboard up to 30 inches wide and 1 inch thick particleboard over 30 inches wide, laminated both sides with melamine in light beige or dove grey color.
 - 8. Shelves shall be edged front edge only with 1mm PVC to match the self color.
- E. Unit Body Closed Interiors:
 - 1. Exposed cabinet sides shall be 3/4 inch thick particleboard laminated on the exterior with high pressure decorative laminate GP28 in color as selected and balanced with high pressure cabinet liner CL20 in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.

2. Unexposed cabinet sides shall be 3/4 inch thick particleboard laminated both sides with melamine in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.
3. Unit top or subtop shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. All sub- tops shall be full depth. Sink base units shall have a 1 inch x 1 inch x 1/8 inch angle iron rail in lieu of full sub- top.
4. Bottom of base and wardrobe units shall be 3/4 inch thick particleboard laminated both sides with melamine and front edges with 1mm PVC to match the door and drawer front edge color. Sink cabinet bottoms shall be laminated both sides with CL20.
5. Fixed intermediates shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. An intermediate will be provided on all units over 36 inches wide.
6. Standard unit backs shall be 1/2 inch thick prefinished particleboard. Color to match interior. Exposed back on fixed or movable cabinet to be 3/4 inch thick particleboard laminated with CL20 on the interior to match melamine color and GP28 on the exterior as selected.
7. Adjustable shelves shall be 3/4 inch thick particleboard up to 30 inches wide and 1 inch thick particleboard over 30 inches wide, laminated both sides with melamine in light beige or dove grey color.
8. Shelves shall be edged front edge only with 1mm PVC to match the shelf color.

F. Wall Unit Bottom:

1. For units with open interiors shall be 3/4 inch thick particleboard laminated both sides with melamine laminate in light beige or dove grey color.
2. For units with closed interiors shall be 3/4 inch thick particleboard laminated both sides with melamine laminate in light beige or dove grey color.
3. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color. The exposed bottom edge of each wall cabinet side shall be edgebanded with 1mm PVC.

G. Drawers:

1. Sides, back and sub-front shall be particleboard, 1/2 inch thick, laminated with melamine in light beige or dove grey color. The back and sub-front are dowelled and glued into sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of eight (8) millimeters. To edge is banded with 1mm PVC edging in a matching color.
2. Drawer bottom shall be 1/2 inch thick prefinished particle- board with color to be light beige or dove grey, screwed directly to the bottom edges of the drawer box.
3. Paper storage drawers are of heavy-duty 3/4 inch particle- board laminated both sides with melamine color to be light beige or dove grey, and constructed with retaining hood at the rear of each drawer.

H. Continuous or Unit Tops:

1. All cabinets over 42" and up to 72" in height shall be supplied with a 3/4" plywood continuous top.
2. All cabinets over 42" and up to 72" in height shall be supplied, where indicated on drawings, with a finished 1" continuous top laminated with high pressure decorative laminate GP28 and balanced with high pressure backer BK20.

I. Bases:

1. Provide and install all base and tall units with finished integral base. Provide 3/4" thick marine grade plywood bases. All bases shall have finished facings unless rubber vinyl base covering is being furnished and applied by others.

2.9 DECORATIVE LAMINATE COUNTERTOPS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Adhesives or fasteners to be provided for securing of tops to cabinet work. Such materials to allow for contraction or expansion of tops where necessary.
- C. Tops shall be 1" thick unless otherwise specified and provided with 4" high curbs where tops abut walls, columns, case ends, etc.
- D. Backsplashes and Side-plashes shall be provided as indicated on drawings.
- E. Types:
 1. Plastic laminate counter tops shall be surfaced with general purpose horizontal grade laminate. Cores shall be 1-1/8" built-up wood front edge; #45 density particleboard. All exposed edges, including back and end splashes, must be covered with the same laminate as top surfaces. When splice joints are required, they shall be joined with dowel pins and tite-joint fasteners as needed for a gapless joint.
- F. Plastic Laminate Type: Fire-rated type, 0.050" thick; UL tested and labeled ratings of 25 for flame spread, 25 for fuel contributed and 100 for smoke developed when bonded to wood particle board.
- G. Preparations for Finishing: Comply with AWI Quality Standards, Section I500, for sanding, filling countersunk fasteners, backpriming and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The installer must examine the jobsite and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION

- A. Conditions laminate clad casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION

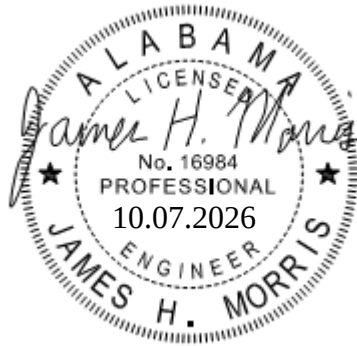
- A. Install casework with factory-trained supervision authorized by manufacturer. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.
- C. Lubricate operating hardware as recommended by Manufacturer.

3.4 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
- C. Advise contractors of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner.

END OF SECTION

DIVISION 15 SPECIFICATIONS



A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15050 - GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for the HVAC systems.

1.2 QUALIFICATIONS OF SUB-CONTRACTORS

- A. Must be properly licensed and established as a Heating and Air Conditioning Contractor at the location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least three systems of this type and size.

1.3 SCOPE

- A. Include all equipment, material and labor required for complete operation of heating, air conditioning and ventilation systems, even though every item involved is not indicated. Included in the scope but not limited by the scope are the following complete new operating systems.

1.4 CODES

- A. Comply with applicable 2013 90.1 ASHRAE, 2021 International Building Code, and 2021 International Mechanical Code requirements and conform to ordinances and codes of the locality. Where conflicts occur between code and construction drawings or specifications, most stringent requirements shall apply. Any work provided contrary to these requirements shall be removed and replaced at contractor's expense.

1.5 PERMITS

- A. Provide all permits and arrange for inspections as required by local, city, county, and state authorities. Furnish certificate of final inspection from local building inspector indicating that installation complies with all regulations governing the same. Provide additional materials, parts, labor, etc. and modify the work as required by city and state inspections and regulations.

1.6 DRAWINGS

- A. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings, and lay out work so as to fit with ceiling grids, lighting, and other parts. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. The Plans are not intended to show all ductwork, pipes valves, fittings, connections, and details of the work to be done. The piping, duct and equipment locations shall be adhered to as closely as possible; however, any changes necessary to avoid columns, beams, lighting fixtures, ductwork, sprinkler piping, etc., shall be made at no additional cost to the owner. Do not scale plumbing or HVAC drawing. Refer to Architectural drawings for dimensions.

1.7 CHANGES AND CONFLICTS

- A. If during construction desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.8 WARRANTY

- A. Contractor shall provide a one-year full parts and labor warranty for materials and workmanship for all items starting at substantial completion of entire project. The following items: but not limited to the following, shall have extended warranties remain in effect past the one-year warranty. All warranty shall start at substantial completion of entire project.

- 1. AC Equipment:

- Provide 2-year parts and labor warranty for entire system.

- Provide 5-year parts warranty for compressors, evaporator coils and condenser coils.

- 2. Control System - Provide 2-year parts and labor warranty for entire system.

- 3. Filters - Contractor shall change all filters every two months for first year.

1.9 MISCELLANEOUS REQUIREMENTS

- A. Materials and Equipment: New and of best quality in every respect. All pipes and fittings shall conform to the ASTM Standard designated for pipe of each material.

Equipment shall be essentially the standard product of the manufacturer and shall be UL approved where required by Code. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be.

- B. Listed Equipment: Being listed as "A supplier of comparable products" means the listed manufacturer will receive consideration if in accordance with all documents, delivery, and space requirements. Being listed does not indicate nor imply the manufacturer's equipment is acceptable for the project. Only the "Base" manufacturer's equipment has been verified for compliance with the documents. The burden of approval of the equipment rests solely with the contractor.

- C. Equipment Protection: Protect during construction, duct openings against the entrance of foreign materials and protect all equipment from damage by mortar, paint, weather,

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

etc. Damaged equipment shall be replaced at no expense to project. Make provisions to protect equipment.

- D. Finishes: Manufacturer's standard unless otherwise stated. Submit color cards for selection where such choice is specified or available.
- E. Charges, Grease, Filters, etc.: Furnish first charges of refrigerant grease, oils, etc., and be responsible for such full charges for the guarantee period, except when loss is due to negligence of Owner. Where disposable type filters are specified, furnish two sets for each air conditioning unit; one set to be used during test period, other set to be installed just prior to occupancy. Contractor shall change all disposable filters every two months for first year. Sets of filters to be installed during one-year guarantee period. Where permanent type is specified, provide disposable type for testing and operating prior to occupancy. Provide Owner a typed list (O & M Manual) of all filter sizes and required quantity.
- F. Cleaning and Adjusting: Upon completion of work, clear drains, traps, ducts, and pipelines. Adjust all valves, remove rubbish, and leave work in clean and operating condition. Install final permanent type filters only after cleaning of building is completed.
- G. Cutting and Patching: Openings are to be laid out and built in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected. Otherwise, walls, etc. affected must be reworked by trade which erected same at expense of HVAC Contractor; chasing and cutting of new work will not be accepted. HVAC Contractor shall prepare shop drawings of required opening to General Contractor and Architect for review.
- H. Foundations: Provide foundations, supports, etc., not specified under other Sections, and as required to mount equipment in a workman like and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work.
- I. Roof Flashing: Roofing work is specified under Roofing Section. Roofer shall be advised of all requirements and all furnished items to be installed before roofing is installed. Roofer shall install all mechanical roof penetration and provide full roof warranty.
- J. Vibration and Noise Control: All items of mechanical equipment including air handling units, and fans shall be properly isolated from the structure by means of approved vibration absorbing accessories, foundations or supports.
Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, etc., required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.
- K. Operating and Maintenance Instructions: Provide the services of a competent person to thoroughly instruct representatives appointed by the owner in the proper operation and care of all equipment and control systems. Furnish a complete set of Operating and Maintenance (O & M Manuals) instructions in 3 copies (including equipment data, spare parts lists, operating instructions, filter sizes, valves services, control, and wiring

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

diagrams) in bound folder form prior to final acceptance. O & M Manuals, Test and Balance report to be submitted 2 weeks prior to final inspection.

- L. Painting and Finishing: Clean and paint with two coats of asphalt varnish all exposed ferrous metal parts of mechanical equipment located above ceilings, etc.). Surfaces in finished areas are to be painted by Painting Contractor. Where factory finished items are marred or scratched item must be replaced, or upon approval, may be refinished or touched-up as required to bring to a like-new condition.
- M. Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 3/8" #8 round head self-threading sheet metal screw, screwed into panel with only the head showing. Before inserting, paint head of screw with appropriate color as specified under Pipe Identification and Color Coding. Furnish sample for approval.
- N. Dis-similar Metal: Separate all dis-similar metals as required for services. Dis-similar metals shall not touch.
- O. Coordination:
 - 1. Mechanical contractor shall submit written verification that he has coordinated all electrical requirements for HVAC with electrical subcontractor. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found. Refer to "EXAMPLE" form at end of this section.

NOTE: Mechanical submittals will not be reviewed without this document included.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

(SEE ATTACHMENT 'A')

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15050A
ATTACHMENT "A"

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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Morris Davis Engineering LLC

James H. Morris, P.E. - Mechanical
Hunter B. Davis, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: XYZ High School - Montgomery, AL DATE: 1-10-11

EQUIP. MARK	DESIGN CHARACTERISTICS					SUBMITTED REQUIREMENTS					CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE		
AH-1	208/3	2 HP	15/3P	30A3P	3#12 & 1#12(G)-1/2" c	208/3	3 HP	20/3P	30A3P	3#12 & 1#12(G)-1/2" c	Y	Change 15/3 CB to 20/3 CB
AH-2	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4" c	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4" c	N	
ACCU-7	208/3	45.3A	60/3P	60A3P	3#6 & 1#10(G)-3/4" c	208/3	43.7A	60/3P	60A3P	3#6 & 1#10(G)-3/4" c	N	
ACCU-9	208/3	15.2A	20/3P	30A3P	3#12 & 1#12(G)-1/2" c	208/3	18.1A	30/3P	30A3P	3#10 & 1#10(G)-3/4" c	Y	See Note 1 below.
CH-1	480/3	155A	200/3P	N/A	3#3/0 & 1 #6(G)-2" c	480/3	183A	250/3P	N/A	3#250M&1#4(G)-2 1/2" c	Y	See Note 2 below.

- NOTES:
- ACCU-9 - Change 20/3P CB to 30/3P CB and change circuit to 3#10&1#10G-1/2"c.
 - CH-1 - Change 200/3P CB to 250/3P CB and change circuit to 3#250 MCM&1#4G-2 1/2"c.

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

James Doe
Electrical Contractor

ABC Electric, Inc.
Company

Henry Smith
Mechanical Contractor

Smith Heating & Air
Company

Joe Thomas
Plumbing Contractor

Joe's Plumbing Company
Company

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Morris Davis Engineering LLC

James H. Morris, P.E. - Mechanical
Hunter B. Davis, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: _____ DATE: _____

[illegible]

NOTES:

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

Electrical Contractor	Mechanical Contractor	Plumbing Contractor
Company	Company	Company

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SECTION 15052 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Concrete bases.
 - 9. Supports and anchorages.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:
 1. CPVC Piping: ASTM F 493.
 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink, and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Non-pressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Attach to substrates as required to support applied loads.

3.8 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout on concrete bases and provide smooth bearing surface for equipment.
- F. Place grout around anchors.
- G. Cure placed grout.

3.9 GENERAL

- A. General and Special Conditions: Refer thereto for all applicable provisions.
- B. Scope: Include all equipment, material and labor required for complete operating plumbing, and gas, even though every item involved is not indicated.
- C. Codes: Comply with 2015 International Plumbing Code, 2015 International Building Code, ADA, LEED specifications sections 18A through 18D, and OSHA of the locality. Where conflicts occur between code and contract drawings or specifications, most stringent requirements shall apply.
- D. Qualifications: Sub-contractor shall be licensed plumber and gas pipe fitter in the locality.
- E. Permits: Provide all permits and arrange for inspections as required by city, county, and state authorities.
- F. Drawings: In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, fittings, and equipment with the detail architectural, structural, and electrical drawings and layout work so as to fit in with other parts. Where doubts arise as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts as may be affected; otherwise, the Contractor shall be liable for damage to work and for removing and repairing his own work in proper manner.
- G. Changes: If during construction, desirable or necessary changes become apparent, advise the architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.
- H. Existing Conditions: Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

misunderstanding regarding utility connections, permits, fees, etc.

- I. Prior Approval: Bidders shall submit equipment for prior approval 10 days before bid date.
- J. Warranty: Guarantee in writing to make good without cost any defects in materials and workmanship within one year from the date of acceptance of project.
- K. Low – Emitting Materials – Adhesives and Sealants: All adhesives and sealants shall comply with LEED 2015 for New Construction Reference Guide. See credits IEQ4.1 and IEQ4.2.
- L. Low – Emitting Materials – Paints and Coatings: All paints and coatings shall comply with LEED 2015 for New Construction Reference Guide. See credits IEQ4.1 and IEQ4.2.
- M. Submittals:
 - 1. Within 25 days the award of the contract and before any orders are planned, the contractor shall submit to the Architect for approval seven (7) copies of a complete list of all proposed materials and all equipment, include catalog data, capacities, model numbers, any accessories, and any pertinent information to indicate full compliance with specification and drawings. Partial list will not be accepted. Rejected items shall be resubmitted until approval has been obtained.
 - 2. The contractor shall submit shop drawings on the following items but not limited to the following items.
 - a. List of proposed materials and equipment.
 - b. Letter stating coordination of plumbing, mechanical and electrical work, signed by plumbing, mechanical, electrical, and general contractors. Submittals and shop drawings will not be reviewed without receipt of this item.
 - c. Shop drawing showing coordination of Plumbing and Electrical.
 - d. Showing drawing of Plumbing of a scale of not less than 1/8-inch equals one foot. The drawing shall show coordination with all HVAC, lighting, conduit, equipment, & etc.
 - e. Pipe hanger shop drawings including methods of attachment to structure anchors.
 - f. Schedule of insulation to be used including thickness. Submittal literature on all insulation, mastics, and materials. Include flame spread and smoke developed ratings.
 - g. Access panels.
 - h. Notify Architect of all pressure tests to be preformed.
 - i. Water closets and accessories.
 - j. Lavatories and accessories.
 - k. Urinals and accessories.
 - l. Type water piping and accessories (interior and exterior)
 - m. Type sanitary drain and vent piping and accessories
 - n. Water heaters and accessories.
 - o. Electric water cooler and accessories.
 - p. Cleanouts (wall, floor, etc)

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- q. Floor drains and floor sinks
- r. Valves
- s. Water hammer arrestor
- t. Wall hydrants and Hose bibbs
- u. Trap Guard & Trap Primer
- v. Mop basin and accessories.
- w. Sinks and accessories.

3.10 PROJECT CLOSE-OUT:

- A. Prior to issuance of certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. A letter signed by the subcontractors for plumbing and electrical work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired, and that controls and power circuits will function properly.
 - 2. Record drawings – waste and vent piping (ACAD 2010 or higher).
 - 3. Record drawings – water piping (ACAD 2010 or higher).
 - 4. Record drawings – gas, and miscellaneous systems (ACAD 2010 or higher).
 - 5. Loose tee keys for wall hydrants shall be turned over to owner.
 - 6. Water/Air pressure test for waste and water systems.
 - 7. Equipment submittal data (3). Furnish in searchable .pdf format.
 - 8. Equipment Operating and Maintenance Manuals (3).
 - 9. Maintenance schedule (3).
 - 10. Equipment warranty dates and guarantee (3).
 - 11. List of Owner's Personnel who have received maintenance training.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15057 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small, and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in plumbing equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers:
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitors start, inductor run.
 - 4. Capacitors start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15061 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.
- B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
1. AAA Technology & Specialties Co., Inc.
 2. Bergen-Power Pipe Supports.
 3. B-Line Systems, Inc.; a division of Cooper Industries.
 4. Carpenter & Paterson, Inc.
 5. Empire Industries, Inc.
 6. ERICO/Michigan Hanger Co.
 7. Globe Pipe Hanger Products, Inc.
 8. Grinnell Corp.
 9. GS Metals Corp.
 10. National Pipe Hanger Corporation.
 11. PHD Manufacturing, Inc.
 12. PHS Industries, Inc.
 13. Piping Technology & Products, Inc.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- 14. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. GS Metals Corp.
 - 4. Power-Strut Div.; Tyco International, Ltd.
 - 5. Thomas & Betts Corporation.
 - 6. Tolco Inc.
 - 7. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation inserts encased in sheet metal shield.
- B. Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. PHS Industries, Inc.
 - 4. Pipe Shields, Inc.
 - 5. Rilco Manufacturing Company, Inc.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. MasterSet Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
- 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 - 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 - 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touch Up: 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 (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 15076 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 VALVE TAGS

- A. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.
- B. Provide location labels on ceiling grid for all valves above ceiling plastic label with adhesive backing 3.2mm thick. Provide engraved valve tag #. Background color white. Letter color red for HW. Blue for CW. Black for HWR 1/4" high letters.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- A New Community Center at Mechanical
Knox Street Park for the
City of Troy
Troy, Alabama

- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Domestic Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 2. Domestic Hot Water and Hot Water Return Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
- D. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15077 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Duct labels.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15082 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Field-applied jackets

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.
8. Detail field application for each equipment type.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Insulation shall be installed by insulation contractor. Plumbing Contractor not acceptable.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Insulco, Division of MFS, Inc.; SmoothKote.
 - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
 - c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

- A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Factory cut and rolled to size.
 - 3. Finish and thickness are indicated in field-applied jacket schedules.
 - 4. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 - 5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 - 6. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

- #### **A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material:** Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by the Contracting Officer. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect field-insulated equipment, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 2. Inspect pipe, fittings, strainers, and valves, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
 - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
- B. Domestic Chilled Water (Potable): Insulation shall be the following:
 - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

END OF SECTION

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SECTION 15086 - DUCT 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 insulating the following duct services:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, exposed supply air.
 - 3. Indoor, concealed return air and outdoor air.
 - 4. Indoor, exposed return air and outdoor air.
- B. Related Sections:
 - 1. Section 15088 "HVAC Piping Insulation."
 - 2. Section 15815 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23.
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 1. Products: Subject to compliance with requirements, provide one of the following:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Johns Manville; 800 Series Spin-Glas.
 - c. Knauf Insulation; Insulation Board.
 - d. Manson Insulation Inc.; AK Board.
 - e. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FlameChek.
 - b. Johns Manville; Firetemp Wrap.
 - c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
 - d. Thermal Ceramics; FireMaster Duct Wrap.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- e. 3M: Fire Barrier Wrap Products.
- f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
 - 2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless-Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 - d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

D. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Polyguard Products, Inc.; Alumaguard 60.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches (75 mm).
2. Thickness: 6.5 mils (0.16 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches (50 mm).
2. Thickness: 3.7 mils (0.093 mm).
3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.8 SECUREMENTS

A. Bands:

1. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.76 mm) thick by 2 inches (50 mm) square.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Spindle: Aluminum, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- D. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.

2.9 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal end at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
 - 1. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

- c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - b. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - c. Do not over compress insulation during installation.
 - d. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 07841 "Through-Penetration Firestop Systems."

3.9 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09911 "Exterior Painting" and Section 09912 "Interior Painting."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, exposed supply air.
 - 3. Indoor, concealed return air and outdoor air.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

4. Indoor, exposed return air and outdoor air.
- B. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums and casings.
 4. Flexible connectors.
 5. Vibration-control devices.
 6. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, supply-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
- B. Concealed, return-air and outdoor air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
- C. Concealed, exhaust-air plenum insulation shall be the following:
1. No insulation.
- D. Exposed, supply-air duct insulation shall be the following:
1. Internally lined (See ductwork).
- E. Exposed, return-air and outdoor air duct insulation shall be the following:
1. Internally lined (See ductwork).

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Ducts and Plenums:
1. Aluminum, with 1-1/4-Inch- (32-mm-) Deep Corrugations: 0.032 inch (0.81 mm) thick.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

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SECTION 15088 - HVAC PIPING 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 insulating the following HVAC piping systems:
 - 1. Condensate drain piping, indoors.
 - 2. Refrigerant suction and hot-gas piping.
- B. Related Sections:
 - 1. Section 15086 "Duct Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 1. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
 2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
 3. Factories fabricate shapes according to ASTM C 450 and ASTM C 585.
 4. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.
 - a. Preformed Pipe Insulation: ASJ.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 - 2. Service Temperature Range: 0 to 180 deg F.
 - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 - 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 - 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 - 4. Color: White.

2.4 SEALANTS

- A. Joint Sealants:
 - 1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- d. Mon-Eco Industries, Inc.; 44-05.
- e. Pittsburgh Corning Corporation; Pittseal 444.

2.5 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- D. Metal Jacket:
 - 1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.

2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

- A. Bands:
 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Handholes.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum jackets.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of fittings, for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Underground piping.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate Drain:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
- B. Refrigerant Suction and Hot-Gas Piping:
 - a. Flexible Elastomeric: 3/4 inch thick.

3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
 - a. Flexible Elastomeric: 3/4 inch thick. (Wrap all exposed exterior piping with aluminum jacket)

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Piping, Exposed:
 - 1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.024 inch thick.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15111 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.
- B. Related Sections:
 - 1. Division 15 plumbing piping Sections for specialty valves applicable to those Sections only.
 - 2. Division 15 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jomar Valve (T-100 CG).
 - b. Kitz Corporation.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Red-White Valve Corporation.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two pieces.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE, TFE, or G300.
 - h. Stem: Brass.
 - i. Ball: T.E.A. coated or chrome plated brass.
 - j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jomar Valve (T-200 CSSG)
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Kitz Corporation.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two pieces.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Bronze or stainless steel.
- i. Ball: Chrome-plated brass or stainless steel.
- j. Port: Regular.
- k.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly, gate, and globe valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
 - 1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball valves.
 - 2. Throttling Service: Globe valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two-piece, full port, brass, or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze disc.
5. Bronze Globe Valves: Class 125, bronze disc.

END OF SECTION

SECTION 15126 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Thermowells.
 - 4. Dial-type pressure gages.
 - 5. Gage attachments.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product certificates.
- C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Ashcroft Inc.
 - 2. Miljoco Corporation.
 - 3. Terice, H. O. Co.
 - 4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 5. Weiss Instruments, Inc.
- C. Standard: ASME B40.200.
- D. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter.
- E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.
- G. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- H. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- I. Window: Plain glass.
- J. Ring: Stainless steel.
- K. Element: Bimetal coil.
- L. Pointer: Dark-colored metal.
- M. Accuracy: Plus, or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Miljoco Corporation.
 - b. Trerice, H. O. Co.
 - c. Weiss Instruments, Inc.
 - 3. Standard: ASME B40.200.
 - 4. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
 - 5. Case Form: Adjustable angle unless otherwise indicated.
 - 6. Tube: Glass with magnifying lens and blue organic liquid.
 - 7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
 - 8. Window: Glass.
 - 9. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
 - 11. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

- A. Thermowells:
 - 1. Standard: ASME B40.200.
 - 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Ashcroft Inc.
 - b. Miljoco Corporation.
 - c. Trerice, H. O. Co.
 - d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - e. Weiss Instruments, Inc.
3. Standard: ASME B40.100.
4. Case: Sealed type(s); cast aluminum or drawn steel; 6-inch (152-mm) nominal diameter.
5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
6. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
7. Movement: Mechanical, with link to pressure element and connection to pointer.
8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
9. Pointer: Dark-colored metal.
10. Window: Glass.
11. Ring: Metal.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
 - 2. Inlets and outlets of each domestic water heat exchanger.
 - 3. Inlet and outlet of each domestic hot-water storage tank.
 - 4. Inlet and outlet of each remote domestic water chiller.
- K. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.
- L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- M. Adjust faces of meters and gages to proper angle for best visibility.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.2 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Industrial-style, liquid-in-glass type.
- B. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

3.4 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
 - 1. Sealed, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 - 1. Sealed, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 - 1. Sealed, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 100 psi (0 to 600 kPa).

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SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Water meters.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Related:

1. New water service piping where water service piping enters the building.
2. Scope: Connect to new 1 1/2" water meter serving building and extend to all plumbing fixtures, etc. Provide gate valve in box, backflow preventer and PRV set at 60 PSI. Pay the water works for any and all cost for meter and connections.
3. Arrange with city for service connection to main, etc. pay city cost of service. Provide full size gate valve.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn
A New Community Center at Mechanical
Knox Street Park for the
City of Troy
Troy, Alabama

temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
 2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
 3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
 4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.
1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

- A. Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
- B. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
1. Description:
 - a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Description:

- a. Factory-fabricated, bolted, companion-flange assembly.
- b. Pressure Rating: 150 psig (1035 kPa).
- c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.6 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
- B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.
- C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.
- D. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.
- E. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge.
- F. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- G. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2.8 SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.9 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 15 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 15 Section "Domestic Water Piping Specialties" for drain valves and strainers.
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for pressure-reducing valves.
- G. Install domestic water piping level and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.
- L. Install piping adjacent to equipment and specialties to allow service and maintenance.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install thermostats in hot-water circulation piping.
- S. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 15 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

larger.

- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 15 Section "Domestic Water Piping Specialties."
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
 - 2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for balancing valves.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.5 FLEXIBLE CONNECTOR INSTALLATION

- A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - 3. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- (10-mm) rod.
- 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
- 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
- 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
- 6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 15 "Plumbing Fixtures" for connection sizes.
 - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
 - 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 - 3. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split casting, cast brass with polished chrome-plated finish.
 - 4. Bare Piping in Unfinished Service Spaces: One-piece, cast brass with polished chrome-plated finish.
 - 5. Bare Piping in Equipment Rooms: One-piece, stamped steel with set screw or stamped steel with spring clips.
 - 6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- K. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
 - 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.
 - a. Extend sleeves 2 inches (50 mm) above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
 - 3. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
 - b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
 - 4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
 - 5. Sleeves for Piping Passing through Exterior Concrete Walls:
 - a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
 - b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
 - c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings,

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 15 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.13 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.14 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Under-building-slab, domestic water, building service piping, NPS 3 (DN 80) and smaller, shall be the following:
1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

solder-joint fittings; and brazed joints.

- C. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 6 (DN 100 to DN 150), shall be the following:
 - 1. Push-on-joint, ductile-iron pipe; standard-pattern push-on-joint fittings; and gasketed joints.
- D. Under-building-slab, domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper solder-joint fittings; and brazed joints.
- E. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper solder-joint fittings; and soldered joints.
- F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper solder-joint fittings; and brazed joints.

3.15 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 - 2. Throttling Duty: Use ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 - 3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
 - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

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SECTION 15145 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Hose bibbs.
7. Wall hydrants.
8. Water hammer arresters.
9. Trap-seal primer valves.
10. Aluminum jacket.

B. See Division 15 Section "Domestic Water Piping" for water meters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

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 New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
3. Standard: ASSE 1001.
4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
5. Body: Bronze.
6. Inlet and Outlet Connections: Threaded.
7. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrowhead Brass Products, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Woodford Manufacturing Company.
 - d. Zurn Plumbing Products Group.
3. Standard: ASSE 1001.
4. Body: Bronze, nonremovable, with manual drain.
5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
6. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Double-Check Backflow-Prevention Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
4. Standard: ASSE 1015.
5. Operation: Continuous-pressure applications, unless otherwise indicated.
6. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

7. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
8. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
9. Configuration: Designed for horizontal flow.
10. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Cash Acme.
 - a. Conbraco Industries, Inc.
 - b. Honeywell Water Controls.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Plumbing Products Group; Wilkins Div.
3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
5. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 for NPS 2-1/2 and larger.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and larger.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Lawler Manufacturing Company, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

d. Symmons Industries, Inc.

4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig (860 kPa).
6. Type: Exposed-mounting, thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded or union inlets and outlet.
9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
10. Valve Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.5 LIMITING VALVES

- A. Temperature Limiting Valve: Zurn ZW3870XLT, Leonard 170D-LF and Sioux Chief Model 696 for all lavatories, sinks, etc., or equivalent by Watts, Acorn, Powers, Symmons, or T&S. Mount in recessed access box with finished frame. (No exceptions on mounting). Provide access panel.

2.6 HOSE BIBBS

- A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.
 4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 6. Pressure Rating: 125 psig (860 kPa).
 7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
 9. Finish for Service Areas: Rough bronze.
 10. Finish for Finished Rooms: Chrome or nickel plated.
 11. Operation for Equipment Rooms: Operating key.
 12. Operation for Service Areas: Operating key.
 13. Operation for Finished Rooms: Operating key.
 14. Include operating key with each operating-key hose bibb.
 15. Include integral wall flange with each chrome- or nickel-plated hose bibb.
- B. Hose Bibb (interior toilets) encased narrow wall hydrant in wall box with loose tee key, Zurn Model Z-1350 (narrow wall hydrant) or equal by J. R. Smith, Wade or Josam.

2.7 WALL HYDRANTS

- A. Wall Hydrants (Typical): Freeze proof box type (stainless steel finish) 1/2" nickel plated bronze hose bibb with loose key, J.R. Smith 5509 QT. Install approximately 18"

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

above finished grade.

A. Non-freeze Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Watts Drainage Products Inc.
 - e. Woodford Manufacturing Company.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig (860 kPa).
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Box: Deep, flush mounting with cover.
10. Box and Cover Finish: Polished nickel bronze.
11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
12. Nozzle and Wall-Plate Finish: Polished nickel bronze.
13. Operating Keys(s): One with each wall hydrant.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. PPP Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products Inc.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER VALVES

- A. TP: Trap Primer: Watts No. A-200, P.P.P. Inc., JR Smith, Wade or Josam; Mount high up under one lavatory in each toilet that has a floor drain. Install cold water supply with 1/2" piping into wall and below slab to floor drain. Provide 12" x 12" access panels for each trap primer. Comparable products of access panels: Williams Bros., Accudor, and Milcor.
- B. Supply-Type, Trap-Seal Primer Valves:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 3. Standard: ASSE 1018.
 4. Pressure Rating: 125 psig (860 kPa) minimum.
 5. Body: Bronze.
 6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
 7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
 8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
 9. TrapGuard or equal by J.R. Smith Trap Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with airgap fitting, fixed airgap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install thermometers and water regulators if specified.
 - 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- G. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.
- H. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Double-check backflow-prevention assemblies.
 - 2. Water pressure-reducing valves.
 - 3. Primary, thermostatic, water mixing valves.
 - 4. Supply-type, trap-seal primer valves.
- I. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Sections.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

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SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.3 SUBMITTALS

- A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM A 74, Service class.
 - 1. Gaskets: ASTM C 564, rubber.
- B. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
 - 2. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
- C. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.
- D. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
 - 2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, soil, waste, and vent piping shall be the following:
 - 1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
 - 2. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 - 4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, soil, waste, and vent piping shall be the following:
 - 1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
 - 2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 - 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.2 PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified.
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch, and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- I. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

- A. General-duty valves are specified in Division 15 Section "General-Duty Valves for Plumbing Piping."
- B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
 1. Install backwater valves in accessible locations.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports for Plumbing Piping." Install the following:
 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports for Plumbing Piping."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches with 3/8-inch (10-mm) rod.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. NPS 3 (DN 80): 48 inches with 1/2-inch (13-mm) rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches with 5/8-inch (16-mm) rod.
 4. NPS 6 (DN 150): 48 inches with 3/4-inch (19-mm) rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- G. Install supports for vertical PVC piping every 48 inches (1200 mm).
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 15155 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof flashing assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
5. Size: Same as connected drainage piping
6. Body Material: As required to match connected piping.
7. Closure: Brass plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

size.

B. Cast-Iron Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Oatey.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Drainage Products Inc.
 - g. Zurn Plumbing Products Group; Light Commercial Operation.
 - h. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Adjustable housing.
7. Body or Ferrule: Cast iron.
8. Clamping Device: Required.
9. Outlet Connection: Threaded.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round.
14. Top Loading Classification: Extra Heavy Duty.
15. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M. Include wall access.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

5. Size: Same as connected drainage piping.
6. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass, or stainless-steel cover plate with screw.
10. Wall Access: Round stainless-steel wall-installation frame and cover.

- D. Cleanouts: Provide in PVC sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 50 feet on 3" and smaller and 75' on 4" and larger on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with gasket or gasketed access cover. Catalog numbers from J.R. Smith, MI-FAB and Zurn. Cleanout head shall not extend out past finish wall, except in unfinished spaces.

In tile floors: Zurn ZN1400-SZ1, MI-FAB C1100-5, adjustable, cast-iron body with ABS plug or gasketed access cover and satin finished square adjustable scoriated secured nickel bronze top or stainless-steel top or J. R. Smith 4051, where soft tile occurs provide ZN1400-TX or J. R. Smith 4171 recessed square adjustable secured nickel bronze or stainless-steel top.

In concrete floors: Zurn Z1400, MI-FAB C1100-XR or J. R. Smith 4237, cast iron with round adjustable scoriated cast iron top with non-tilt tractor cover ferrule with ABS plug or gasketed access cover.

In outside lines: Zurn Z1402, MI-FAB C1230 or J. R. Smith 4291, terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In accessible unfinished spaces: Zurn Z1445, MI-FAB C1460 or J. R. Smith 4511S or cast iron with ABS plug as appropriate

In finished walls: J. R. Smith 4531, MI-FAB C1460-RD or Zurn Z1446 cast iron cleanout tee with countersunk ABS plug and stainless-steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4402 or MI-FAB C1450-RD extended over from sanitary tee to bring plug within 4 inches.

In terrazzo floors: J. R. Smith 4191, MI-FAB C1100-UR or Zurn ZN1400-Z adjustable cast iron head and ferrule, ABS plug and round adjustable secured nickel bronze or stainless-steel top with 1/2" recess.

2.2 FLOOR DRAINS

- A. Cast-Iron Floor Drains:

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 New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.6.3.
5. Pattern: Area drain.
6. Body Material: Gray iron.
7. Seepage Flange: Required.
8. Anchor Flange: Required.
9. Clamping Device: Required.
10. Outlet: Bottom.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: As required.
13. Top or Strainer Material: Bronze.
14. Top of Body and Strainer Finish: Rough bronze.
15. Top Shape: Round.
16. Top Loading Classification: Extra Heavy-Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Bronze.
20. Trap Pattern: Deep-seal P-trap.
21. Trap Features: Cleanout and trap-seal primer valve drain connection.

- B. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain to have cast iron P-trap. Provide types as scheduled below.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Typical Floor Drains: Smith 2005B, MI-FAB1100-C-S or Zurn ZN415-SZ1 two-piece cast iron drains with speedi-set type outlet and adjustable nickel bronze or stainless-steel strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6". Membrane clamp where required. Floor drains shall have tap for trap primer as required by code and deep seal 'P' traps.

Mechanical Room Drains: Smith 2230Y, MI-FAB F1340-TFB-4 or Zurn Z541 two-piece cast iron drain with speedi-set outlet, sediment bucket and cast-iron grate. Membrane clamp as required.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

Kitchen Area Floor Sink: Kitchen Area Floor Sinks (FS) J. R. Smith 3151-13-L or Zurn ZN1901- 3 with stainless steel or nickel bronze rim, ¾ grate, flashing clamp if required, aluminum dome strainer, acid resistant enameled interior finish, 8" deep.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Acorn Engineering Company; Elmdor/Stoneman Div.
 - b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe, with galvanized-steel boot reinforcement and counter-flashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
 - b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

D. Air-Gap Fittings:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
 2. Body: Bronze or cast iron.
 3. Inlet: Opening in top of body.
 4. Outlet: Larger than inlet.
 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping
- E. Sleeve Flashing Device:
1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
 2. Size: As required for close fit to riser or stack piping.
- F. Stack Flashing Fittings:
1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
 2. Size: Same as connected stack vent or vent stack.
- G. Vent Caps:
1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
 2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
 2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B 32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining
- A New Community Center at Mechanical
Knox Street Park for the
City of Troy
Troy, Alabama

materials, joint construction, and basic installation requirements.

- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Assemble open drain fittings and install with top of hub 1 inch (25 mm) above floor.
- I. Install deep-seal traps on floor drains and condensate waste outlets.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.

- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

discharge into sanitary drainage system.

- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install traps on plumbing specialty drain outlets.
- O. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-454B:
 - 1. Suction Lines for Heat-Pump Applications: 600 psig using dry nitrogen (2241 kPa).
 - 2. Hot-Gas and Liquid Lines: 600 psig using dry nitrogen (2241 kPa).

1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig (3450 kPa).
 - 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- B. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 275 deg F (135 deg C).
- C. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig (3450 kPa).
- D. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
 6. Working Pressure Rating: 450 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 450 psig (2760 kPa).
 6. Maximum Operating Temperature: 240 deg F (116 deg C).
- F. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F (4.4 deg C).
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

9. Working Pressure Rating: 700 psig (4820 kPa).

G. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig (3450 kPa).
5. Maximum Operating Temperature: 275 deg F (135 deg C).

H. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F (135 deg C).

I. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

J. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

K. Permanent Filter Dryers: Comply with ARI 730.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina or charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- L. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.3 REFRIGERANTS

- A. 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- C. ASHRAE 34, R-454B.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump and AC Unit Applications: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with soldered joints.
- B. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with soldered joints.
- C. Safety-Relief-Valve Discharge Piping:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. NPS 1-1/2 and Smaller: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 1. Install valve so diaphragm case is warmer than bulb.
 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 1. Solenoid valves.
 2. Thermostatic expansion valves.
 3. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers according to Division 7 Section "Through-Penetration Firestop Systems."
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls according to Division 7 Section "Joint Sealants" for materials and methods.
- V. Identify refrigerant piping and valves according to Division 23 Section "Mechanical Identification."

3.4 PIPE JOINT CONSTRUCTION

- A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section Mechanical
- A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

"Hangers and Supports."

- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
- D. Support multi-floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 - 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Verify that compressor oil level is correct.
 - 2. Open compressor suction and discharge valves.
 - 3. Open refrigerant valves except bypass valves that are used for other purposes.
 - 4. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plumbing fixtures.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities "Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 4. Stainless-Steel Residential Sinks: ASME A112.19.3.
 - 5. Vitreous-China Fixtures: ASME A112.19.2M.
 - 6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 4. Faucets: ASME A112.18.1.
 - 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 6. Hose-Coupling Threads: ASME B1.20.7.
 - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 8. NSF Potable-Water Materials: NSF 61.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

9. Pipe Threads: ASME B1.20.1.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Supply Fittings: ASME A112.18.1.
 12. Brass Waste Fittings: ASME A112.18.2.
- H. Comply with the following applicable standards and other requirements specified for shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Dishwasher Air-Gap Fittings: ASSE 1021.
 4. Manual-Operation Flushometers: ASSE 1037.
 5. Plastic Tubular Fittings: ASTM F 409.
 6. Brass Waste Fittings: ASME A112.18.2.
 7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Dishwasher Air-Gap Fittings: ASSE 1021.
 3. Flexible Water Connectors: ASME A112.18.6.
 4. Grab Bars: ASTM F 446.
 5. Hose-Coupling Threads: ASME B1.20.7.
 6. Off-Floor Fixture Supports: ASME A112.6.1M.
 7. Pipe Threads: ASME B1.20.1.
 8. Plastic Toilet Seats: ANSI Z124.5.
 9. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 FIXTURES AND MISCELLANEOUS ITEMS

- A. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixture manufacturer. Supplies to all fixtures and equipment shall be provided with stop valves.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

B. Scheduled Items:

WC-1 ADA FLOOR MOUNTED FLUSH VALVE

ZURN Z5665-BWL-1 (1.6 gpf) ADA height floor mount top spud flush valve toilet; Z6200 (HET) YB YC YK piston-operated manual flush. Provide Bemis 1955 SS CT white seat with Sta-Tight fastening system, closet bolt/wax ring kit. No carrier required. Equal by Kohler, American Standard or Toto. Flush valve equal to Toto or Sloan Crown..

WC-2 FLOOR MOUNTED FLUSH VALVE

ZURN Z5655-BWL-1 (1.6 gpf) floor mount top spud flush valve toilet, Z6200 (HET) YB YC YK piston-operated manual flush valve. Provide Bemis 1955 SS CT white seat with Sta-Tight fastening system, closet bolt/wax ring kit. No carrier required. Equal by Kohler, American Standard or Toto. Flush valve equal to Toto or Sloan Crown.

UR-1 ADA

ZURN: Z5755U (1.0) top spud siphon jet urinal; with vandal resistant flat strainer, Z6203 YB YC YK (WS 1.0) manual piston flush valve. Furnish Zurn Z1222 urinal carrier or equal by J. R. Smith. Mount 17" maximum highest point of lip to finished floor. Equal By: American Standard Kohler, and Toto. Flush valve equal to Toto or Sloan Crown.

UR-2 STANDARD

ZURN: Z5755U (1.0) top spud siphon jet urinal; with vandal resistant flat strainer, Z6203 YB YC YK (WS 1.0) manual piston flush valve. Furnish Zurn Z1222 urinal carrier or equal by J. R. Smith. Equal By: American Standard, Kohler, and Toto. Flush valve equal to Toto or Sloan Crown.

L-1 LAVATORY WALL HUNG ADA

ZURN Z5328 20 X 18" wall hung concealed arm lavatory with Z831R1-XL-3M manual lavatory faucet with 2.5" lever handles. Z8746-PC off set grid drain, Z8700PC cast 1 1/4" p-trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J. R. Smith. Equal units by Kohler, American Standard, Toto, T & S, Chicago and McGuire. Mount 34" rim to finished floor.

L-2 LAVATORY WALL HUNG

ZURN Z5328 20 X 18" wall hung concealed arm lavatory with Z831R1-XL-3M manual lavatory faucet with 2.5" lever handles. Z8746-PC off set grid drain, Z8700PC cast 1 1/4" p-trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J. R. Smith. Equal units by Kohler, American Standard, Toto, T & S, Chicago and McGuire

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

MB-1 MOP SINK

Zurn Z1996-24, 24 X 24 X 10" mop basin. Complete with HH hose and wall hook, MH Mop hanger, WG wall guard and Z843M1-RC service sink faucet. Equals by Fiat or Mustee or Central Brass.

EW-1 ELECTRICAL WATER COOLER:

Bi-Level ADA Indoor Electric Water Cooler with Bottle Filler:

Elkay # LZSTL8WSMP-PF, bi-level, ADA cooler, refrigerated stainless steel high-capacity lead reduction filtered, wall mounted, front and side bubbler push bar, electronic bottle filler sensor, ADA and ICC A117.1 compliant with cane apron where required, midnight black PFOA/PFOS/Lead reduction drop down wrapper cabinet and receptor coordinate finish with owner and architect midnight black, artic white or stainless steel, safety bubbler, and 5-year warranty on refrigeration system. It shall provide 8 gal/hr. of filtered water at 50°F based on 80°F inlet water and 90°F ambient temperature, per ASHRAE 18 testing. Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120 and NSF/ANSI 42, 53, 61 & 372 for lead free compliant design. Unit shall be provided with quick filter change wrapper providing easy access to filter from the front and side of cooler for efficient filter changes. Furnish with 1-1/4" rough brass p-trap, 17-gauge brass tailpiece and waste with wheelless stop valve, concealed floor mounted carrier Zurn Z1225 BL EZ or equal by J. R. Smith. Refer to Architectural plan for wall type. Equivalent units by Halsey Taylor, Haws or Murdock will be considered. Provide three (3) 51600C Water Sentry Plus Replacement Filters, 6,000-gallon filter tested and certified to NSF 42 and 53 under manufacturer's name to reduce lead, Class 1 particulates and chlorine taste and odor certified to NSF 42, NSF 53, NSF-401 and NSF 372 a greater than stated product flow rate for each bi-level water cooler provided. Upon completion of the project, turn over replacement filters to Architect for transfer to Owner

S-1 SINK SINGLE COMPARTMENT ADA STAINLESS STEEL ELKAY LRAD 1716 45 18-gauge 304 stainless steel single compartment sink, 17 X 16 X 4.5" deep. Zurn Z831B4 XL-5F faucet with wrist blade handles: Elkay LKAD-18 strainer, Zurn ZH8824 XL LR heavy duty stops, Z8860 XL-12-SS stainless steel braided hose supplies, Zurn Z8702PC 1 1/2" cast p-trap and Zurn Z8946-3NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Equal fixtures by Just, Symmons, T & S or McGuire.

S-2: Sink: Existing relocated 3 compartment pot sink.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.
- M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- P. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- Q. Install traps on fixture outlets.
 1. Exception: Omit trap on fixtures with integral traps.
 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- R. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by the Contracting Officer.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15485 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Household, storage electric water heaters.
 - 2. Light-commercial electric water heaters.
 - 3. Commercial electric booster heaters.
 - 4. Commercial, storage electric water heaters.
 - 5. Water heater accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 QUALITY ASSURANCE

- A. 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.
- B. ASHRAE/IESNA-90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period(s): From date of Substantial Completion:
- a. Commercial Electric Water Heaters: Three years.

PART 2 - PRODUCTS

2.1 WATER HEATERS

- A. Water Heater (WH-1): Electric water heater 30-gallon storage capacity, recovery capacity 25 GPH at 100-degree rise, 6 KW heating element for 208/1/60 cycle current; Rheem Model EGSP30. Comparable products by: Rudd, A.O Smith, State or Hubbell.
- B. Water Heater (WH-2): Existing relocated 50 gallon 6KW 208/1/60.
- C. Temperature Limiting Valve Sioux Chief Model 696, Zurn Model ZW3870DXLT, or Leonard 170-LF-BRKT for all lavatories, sinks, etc., or equivalent by Watts, Zurn Wilkins, Powers, Symmons, or T & S. Set temperature to 105-degree Fahrenheit. Mount recessed and secured in wall box with access panel. No exceptions.
- D. Relief Valves: Install (in accordance with USA Standard 221.22) properly sized AGA and ASME approved T&P relief valves with copper overflow lines to floor drain as indicated.
- E. Safety Pan: Minimum of 1-1/2" deep X diameter of water heater plus 3" galvanized steel with a minimum of 1" drain.
- F. Thermal Expansion Tank: Zurn Wilkins min. cap 2.1 gallons.
- G. Provide braided copper bonding jumper between cold and hot water lines for grounding purposes.
- H. Circulating Pump: Pump shall be Grundfos Alpha 15-55F all bronze pump with 1/20 HP motor, 120V, 1 PH with built-in overload protection. Pump shall have a capacity of 7 GPM at 10-foot head. Comparable products by: Bell & Gossett, Paco.
- I. Provide Time Clock (seven-day) for pump control 120/1/60 operating hours, 6:00 A.M. - 5:00 P.M. Monday through Friday. Verify with owner for weekend operation. Tork Model T171.
- I. A nominal water containing capacity of 5 gallons if located in building owned by or under the control of the state, county, municipality, separate school district or other public entity.

These units are required to be registered with the state. They receive a biennial inspection and certificate of operation. They are not required to have an installation permit or have ASME/NB stamping.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2.2 WATER HEATER ACCESSORIES

- A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.
- B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.
- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.
- F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages for Plumbing Piping" for thermometers. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.
- F. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- G. Fill water heaters with water.

3.2 CONNECTIONS

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

3.3 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.
- B. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

SECTION 15671 - OUTDOOR CONDENSING UNITS AND HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes air-cooled condensing units and outdoor heat pumps.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Wiring diagrams.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
 - 2. Warranty Period (Condenser and evaporator Coils): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONDENSING UNITS AND OUTDOOR HEAT PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:
 - 1. Trane.
 - 2. Carrier.

2.2 OUTDOOR UNITS

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

A. General:

1. Weatherproofed steel mounting/lifting rails.
2. Hermetic scroll compressors.
3. Plate fin condenser coils.
4. Fans and motors.
5. Standard operating range 50-125°F (min. 0°F with low ambient accy.).
6. Nitrogen holding charge.
7. Certified and rated in accordance with AHRI and DOE standards.
8. UL certified.

B. Casing:

1. Zinc coated, heavy gauge, galvanized steel.
2. Weather resistant baked enamel finish.
3. Meets 672 hr salt spray test.
4. Removable single side maintenance access panels.
5. Lifting handles in maintenance access panels.
6. Unit base provisions for forklift and/or crane lifting.

C. Refrigeration System:

1. Dual compressor (10 ton and larger).
2. Two (2) separate and independent refrigerant circuits (10 tons or larger).
3. Each refrigeration circuit equipped with integral sub-cooling circuit.
4. Two (2) direct drive hermetic scroll compressor with centrifugal oil pump providing lubrication to moving parts.
5. Suction gas-cooled motors with +/- 10% voltage utilization range of unit nameplate voltage.
6. Crankcase heaters.
7. Internal temperature and current sensitive motor overloads.
8. Factory installed liquid line filter driers.
9. Phase loss/reverse rotation monitor.
10. Liquid line service valves (with gauge port).
11. Suction line service valves (with gauge port).
12. External high-pressure cutout devices.
13. External low-pressure cutout devices.
14. Evaporators defrost control.
15. Loss of charge protection (discharge line thermostats).

D. Condenser Coil:

1. 3/8" internally enhanced copper tube mechanically bonded to lanced aluminum rate fins (spine fin coil for five tons or larger).
2. Factory pressure and leak tested to 660 psig.
3. Perforated steel hail-guards available.
4. Provide coil guards.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- E. Condenser Fan:
 - 1. Propeller fan(s).
 - 2. Direct drive.
 - 3. Statically and dynamically balanced.
- F. Condenser Motor(s):
 - 1. Permanently lubricated, totally enclosed or open construction.
 - 2. Built-in current and thermal overloads.
 - 3. Ball or sleeve bearing type.
- G. Controls:
 - 1. Microprocessor.
 - 2. Completely internally wired.
 - 3. Numbered and colored wires.
 - 4. Contactor pressure lugs or terminal block.
 - 5. Unit external mounting location for disconnect device.
 - 6. Single point power entry.
 - 7. 24V control circuit.
 - 8. Control transformer.
 - 9. Anti-short cycle timer.
- H. Hail-Guards:
 - 1. Condenser coil protection from hail, vandals, etc.
 - 2. Perforated, painted galvanized steel.
 - 3. Factory or field installed.

2.3 VERIFICATION OF PERFORMANCE

- A. Rate condensing units according to ARI 210/240.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units' level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- B. Install condensing units on 4" concrete base.
- C. Vibration Isolation: Mount condensing units on neoprene pads with a minimum deflection of 1/2".
- D. Maintain manufacturer's recommended clearances for service and maintenance.
- E. Connect pre-charged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- F. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 15 Section "Refrigerant Piping."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Verify proper airflow over coils.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- C. Remove and replace malfunctioning condensing units and retest as specified above.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15725 - INDOOR HEAT PUMP UNIT

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. Section Includes:
 - 1. Constant-air-volume, air-handling units (unless otherwise noted on plans).

1.3 SUBMITTALS:

- A. Product Data: For each air-handling unit indicated.
 - 1. Unit dimensions and weight.
 - 2. Cabinet material, metal thickness, finishes, insulation, and accessories.
 - 3. Fans:
 - a. Certified fan-performance curves with system operating conditions indicated.
 - b. Certified fan-sound power ratings.
 - c. Fan construction and accessories.
 - d. Motor ratings, electrical characteristics, and motor accessories.
 - 4. Certified coil-performance ratings with system operating conditions indicated.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Filters with performance characteristics.
- B. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
 - 2. Support location, type, and weight.
 - 3. Field measurements.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1.4 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. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.
- C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.
- D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. Comply with NFPA 70.

1.5 COORDINATION:

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.6 EXTRA MATERIALS:

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: Four set(s) for each air-handling unit.
 - 2. Gaskets: One set(s) for each access door.
 - 3. Fan Belts: Two set(s) for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Trane.
 - 2. Carrier.

2.2 INDOOR AHU:

- A. General:
 - 1. Completely factory assembled.
 - 2. Convertible for horizontal or vertical configuration.
 - 3. Convertible for cooling only or heat pump application.
 - 4. Convertible for left or right external connections (refrigerant and/or electrical).
 - 5. Convertible for front or bottom air return.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

6. Nitrogen holding charge.
 7. Certified and rated in accordance with AHRI and DOE standards.
 8. Certified to UL 1995 for indoor blower coil units.
- B. Casing:
1. Zinc coated, heavy gauge, galvanized steel.
 2. Weather resistant baked enamel finish.
 3. Access panels with captive screws.
 4. Completely insulated with foil faced, cleanable, fire retardant, permanent, odorless glass fiber material.
 5. Captured or sealed insulation edges.
 6. Electrical connection bushings or plugs.
 7. Refrigerant connection bushings or plugs.
- C. Refrigeration System:
1. Single or dual circuit.
 2. Distributor(s).
 3. Thermal expansion valves (TXVs).
- D. Refrigerant Release Mitigation Controls: Unit shall be furnished with a refrigerant release mitigation control system that is listed per UL 60335-2-40 from the factory when a circuit refrigerant charge exceeds 3.91 lbs. The refrigerant release mitigation system shall consist of one or more refrigerant detection sensors. When the system detects a leak, the unit controller shall initiate refrigerant mitigation actions and isolate all possible paths of refrigerant that can leak into the space(s). Refrigerant Release Mitigation Controls shall be tested in accordance with ASHRAE 15 -2022.9.13.
- E. Refrigerant Mitigation Action Requirements: The following mitigation actions shall be completed in not more than 15 seconds after the initiation of leak detection sensor and shall be maintained for at least 5 minutes after the output signal is reset.
- a. De-energize potential ignition sources, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kVA, where the apparent power is the product of the circuit voltage and current rating.
- F. Evaporator Coil:
1. 3/8" internally enhanced copper tube mechanically bonded to lanced aluminum plate fins.
 2. Factory pressure and leak tested to 449 psig.
 3. Draw-through airflow.
 4. Dual circuits are interlaced/intertwined.
 5. Double slope, removable, cleanable, composite drain pan.
 6. Four (4) drain pan positions.
- G. Indoor Fan:
1. Double inlet, double width, forward and curved, centrifugal type fan.
 2. Dual fans on 12.5-20T air handlers.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Adjustable belt drive.
 4. Permanently lubricated bearings.
- H. Indoor Motor:
1. Adjustable motor sheaves.
 2. Thermal overload protection.
 3. Permanently lubricated bearings.
 4. Meet 2007 ASHRAE 90.1.
 5. Motors for high static applications.
- I. Controls:
1. Completely internally wired.
 2. Numbered and colored wires.
 3. Magnetic indoor fan contactor.
 4. Low voltage terminal strip.
 5. Single point power entry.
 6. Evaporators defrost control.
- J. Filters:
1. Access from side coil panels.
 2. Filters slide on rack.
 3. One inch (1"), MERV 8 filters on 5-10-ton units.
 4. Two inches (2"), MERV 8 filters on 12.5-20-ton units.
- K. Electric Heaters:
1. Heavy duty nickel chromium elements.
 2. cETL approved.
 3. Installs directly on fan discharges.
 4. Two stage control.
 5. Single point power entry.
 6. Terminal strip connections
 7. Automatic line break high limit controls.

2.3 SOURCE QUALITY CONTROL:

- A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.
- B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Refrigerant Coils: Factory tested to 450 psig (3105 kPa) according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

- A. Equipment Mounting: Install air-handling units on concrete bases.
 - 1. Minimum Deflection: 1 inch (25 mm).
- B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

3.3 CONNECTIONS:

- A. Comply with requirements for piping specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to air-handling unit to allow service and maintenance.
- C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.
- D. Connect condensate drain pans using NPS 1-1/4 (DN 32), ASTM B 88, Schedule 40 PVC piping. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- E. Refrigerant Piping: Comply with applicable requirements in Division 15 Section "Refrigerant Piping." Install shutoff valve and union or flange at each supply and return connection.

3.4 FIELD QUALITY CONTROL:

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

3.5 STARTUP SERVICE:

- A. Perform startup service.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Complete installation and startup check according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Install new, clean filters.
9. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING:

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Division 15 Section "Testing, Adjusting, and Balancing" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING:

- A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION:

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

SECTION 15739 - DUCTLESS SPLIT-SYSTEM AIR CONDITIONING UNITS

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. Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.4 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.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

1. Warranty Period:
 - a. For Compressor: Five year(s) from date of Substantial Completion.
 - b. For Parts: One year(s) from date of Substantial Completion.
 - c. For Labor: One year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: 4 set(s) for each air-handling unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following: Verify that manufacturers retained in the list below make combination of unit components retained.
 1. Trane/Mitsubishi.
 2. LG.
 3. Daikin.

2.2 INDOOR UNITS

- A. Evaporator-Fan Components:
 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 2. Insulation: Faced, closed cell duct liner.
 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
 4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
 5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - b. Constant speed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
 7. Filters: Permanent, cleanable.
 8. Condensate Drain Pans:
 - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

headers, and return bends) and to direct water toward drain connection.

- 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004.
- b. Single-wall, galvanized-steel sheet, or HDPE molded sheet.
- c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

2.3 OUTDOOR UNITS

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater with variable speed drive and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Refrigerant Charge: R-410A.
 - c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.
 - d. Coil Guards.
3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection. Motor to have variable speed drive.
5. Low Ambient Kit: Permits operation down to 10 deg F (-12.22 deg C).
6. Mounting Base: Polyethylene.

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- B. Thermostat: Wall mounted thermostat. Provide auto changeover.
- C. Automatic-reset timer to prevent rapid cycling of compressor.
- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.
- F. Coil guard.

PART 3 - EXECUTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

3.1 INSTALLATION

- A. Install units' level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base that is 4 inches (100 mm) larger, on each side, than unit.

3.2 CONNECTIONS

- A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15815 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Double-wall round and flat-oval ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.

B. Related Sections:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.3 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

5. Dimensions of main duct runs from building grid lines.
 6. Fittings.
 7. Reinforcement and spacing.
 8. Seam and joint construction.
 9. Penetrations through fire-rated and other partitions.
 10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. 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. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- D. Welding certificates.
- E. Field quality-control reports

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eastern Sheet Metal
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eastern Sheet Metal.
 2. McGill AirFlow LLC.
 3. SEMCO Incorporated.
 4. Sheet Metal Connectors, Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
 1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams -

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
 - b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Inner Duct: Minimum 0.028-inch (0.7-mm) solid galvanized sheet steel.
- E. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60 (Z180).
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Tough Guard or comparable product by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 2. Maximum Thermal Conductivity:
 - a. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.
 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA Inc.
 - b. Armacell LLC.
 - c. Rubatex International, LLC
 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

C. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches (102 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

inches (1200 mm) of each branch intersection.

- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.7 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Supply Ducts:
 - 1. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 4-inch wg (750 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- C. Return and Outdoor Air Ducts:
 - 1. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 - 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 3.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- D. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- E. Outdoor-Air Ducts:
 - 1. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- F. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
- G. Liner:
 - 1. Transfer Ducts: Fibrous-glass duct liner, 1 inch (25 mm) thick.
 - 2. Supply Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick.
 - a. 20' downstream AHU.
 - b. Exposed ductwork (double wall).
 - 3. Return Air Ducts: Fibrous-glass duct liner, 1 inch (25 mm) thick.
 - a. 20' upstream AHU.
 - b. Exposed ductwork (double wall).
 - 4. Exhaust Air Duct: None.
- H. Double-Wall Duct Interstitial Insulation:
 - 1. Exposed Supply Air Ducts: Fibrous-glass duct liner, 1 inch (25 mm) thick.
- I. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.
- J. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Rectangular to round with standoff quadrant.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Manual volume dampers.
 - 3. Control dampers.
 - 4. Fire dampers.
 - 5. Flange connectors.
 - 6. Turning vanes.
 - 7. Duct-mounted access doors.
 - 8. Flexible connectors.
 - 9. Flexible ducts.
 - 10. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control damper installations.
 - d. Fire-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.
 - 2. Greenheck Fan Corporation.
 - 3. Nailor Industries Inc.
 - 4. Ruskin Company.
 - 5. SEMCO Incorporated.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 1-inch wg (0.25 kPa).
- E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
 - 1. Material: Galvanized steel.
 - 2. Diameter: 0.20 inch (5 mm).
- J. Tie Bars and Brackets: Aluminum.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Electric actuators.
 - 4. Chain pulls.
 - 5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
 - b. Sleeve Length: 6 inches (152 mm) minimum.
 - 6. Screen Mounting: Rear mounted.
 - 7. Screen Material: Galvanized steel.
 - 8. Screen Type: Insect.
 - 9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Warming and Ventilating; a division of Mestek, Inc.
 - b. Flexmaster U.S.A., Inc.
 - c. METALAIRE, Inc.
 - d. Nailor Industries Inc.
 - e. Ruskin Company.
 - 2. Standard leakage rating.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
- 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, 0.064 inch (1.62 mm) thick.
- 6. Blade Axles: Galvanized steel.
- 7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.
 - 2. Arrow United Industries; a division of Mestek, Inc.
 - 3. Flexmaster U.S.A., Inc.
 - 4. Greenheck Fan Corporation.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Ruskin Company.
 - 8. Young Regulator Company.
- B. Frames:
 - 1. Hat shaped.
 - 2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
 - 3. Mitered and welded corners.
- C. Blades:
 - 1. Multiple blades with maximum blade width of 8 inches (200 mm).
 - 2. Parallel- and opposed-blade design.
 - 3. Galvanized steel.
 - 4. 0.064 inch (1.62 mm) thick.
 - 5. Blade Edging: Closed-cell neoprene edging.
 - 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- D. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
 - 1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- E. Bearings:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Air Balance Inc.; a division of Mestek, Inc.
 2. Greenheck Fan Corporation.
 3. McGill AirFlow LLC.
 4. METALAIRE, Inc.
 5. Nailor Industries Inc.
 6. Prefco; Perfect Air Control, Inc.
 7. Ruskin Company.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.6 FLANGE CONNECTORS

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Nexus PDQ; Division of Shilco Holdings Inc.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Flexmaster U.S.A., Inc.
 - 4. Greenheck Fan Corporation.
 - 5. McGill AirFlow LLC.
 - 6. Nailor Industries Inc.
 - 7. Ventfabrics, Inc.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
 - d. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside handles.
 - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

2.9 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Flame Gard, Inc.
 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).
- F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.10 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.11 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.
- C. Flexible Duct Connectors:
1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

instruments and of length to suit duct-insulation thickness.

- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.
- H. Connect ducts to duct silencers rigidly.
- I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot (15-m) spacing.
 - 8. Upstream from turning vanes.
 - 9. Control devices requiring inspection.
 - 10. Elsewhere as indicated.
- J. Install access doors with swing against duct static pressure.
- K. Access Door Sizes:
- 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 - 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 - 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
 - 4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 - 5. Body Access: 25 by 14 inches (635 by 355 mm).
 - 6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- L. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- M. Install flexible connectors to connect ducts to equipment.
- N. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- O. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.
- P. Connect diffusers or light troffer boots to ducts with maximum 48-inch lengths of flexible duct clamped or strapped in place.
- Q. Connect flexible ducts to metal ducts with draw bands.
- R. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
- 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

SECTION 15838 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. In-Line and Ceiling centrifugal fans.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 IN-LINE AND CEILING CENTRIFUGAL FANS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Loren Cook Company.
 - 2. Greenheck Fan Corporation.
 - 3. Carnes Company.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel and inlet cone.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Companion Flanges: For inlet and outlet duct connections.
 - 3. Factory mounted disconnect switch.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In-Line and Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- B. Install units with clearances for service and maintenance.
- C. Label units according to requirements specified in Division 15 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system and align.
 - 5. Adjust damper linkages for proper damper operation.
 - 6. Verify lubrication for bearings and other moving parts.
 - 7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 9. Shut unit down and reconnect automatic temperature-control operators.
 - 10. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rectangular and square ceiling diffusers.
 - 2. Fixed face registers.
- B. Related Sections:
 - 1. Division 10 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether they are connected to ducts.
 - 2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 MANUFACTURERS

- 1. TITUS.
- 2. Metalaire.
- 3. Price.
- 4. Hart & Cooley

PART 2 - PRODUCTS

2.1 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: The control system shall be as indicated on the drawings and described in the specifications and consist of a communicating thermostat.

1.2 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

- A. Approved Building Control System Contractors and Manufacturers: Precision Environmental Solutions, Trane Controls, Walters Controls, Alabama Industrial Controls, Alberio, Commercial Controls Group, Gulf States Automation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.

2.2 COMMUNICATING, PROGRAMMABLE, TOUCH-SCREEN ROOM CONTROLLERS

- A. General: Stand Alone – EasyDri STN855WHD-T5 with Honeywell C7233 CO2 Sensore (Recommended) – or KMC Controls BAC-190000 Series FlexStat, Honeywell TC500 or Schneider Electric SE8600 Series (Touchscreen 7-Day Programmable) Indoor Air Quality and AC Unit Controllers with Humidity capability and Re-Heat Function capability. These are designed for single-stage and multi-stage control of heating/cooling equipment such as self-contained indoor air quality, heat pumps and AC units.

2.3 AUXILIARY CONTROL DEVICES

- A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:
 - 1. Damper frames shall be 16-gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
 - 2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauges.
 - 3. Damper shaft bearings shall be as recommended by manufacturer for application.
 - 4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" W.C. differential pressure.
5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
 6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.
- B. Control dampers shall be parallel or opposed blade types as scheduled on drawings.
- C. Electric damper/valve actuators.
1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
 3. All rotary spring return actuators shall be capable of both clockwise and counterclockwise spring return operation. Linear actuators shall spring return to the retracted position.
 4. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
 5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
 6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 7. Actuators shall be Underwriters Laboratories Standard 873 listed.
 8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.
- D. Binary Temperature Devices
1. Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
 2. Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
 3. Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

E. Temperature Sensors

1. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
2. Duct sensors shall be rigid or average as shown. Averaging sensors shall be a minimum of 1.5m (5 feet) in length.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors shall be equipped with set-point adjustment, override switch, display, and/or communication port as shown on the drawings.
5. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.1 C (0.2 F)
6. The space temperature, setpoint, and override confirmation will be annunciated by a digital display for each zone sensor. The setpoint will be selectable utilizing buttons.

G. Humidity Sensors

1. Duct and room sensors shall have a sensing range of 20% to 80% with accuracy of $\pm 5\%$ R.H.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. It shall be suitable for ambient conditions of -40 C to 75 C (40 F to 170 F)
4. Humidity sensor's drift shall not exceed 1% of full scale per year.

A. Low Limit Thermostats

1. Safety low limit thermostats shall be vapor pressure type with an element 6m (0 ft) minimum length. Element shall respond to the lowest temperature sensed by any one-foot section.
2. Low limit shall be manual reset only.

B. Relays

1. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

C. Transformers and Power Supplies

1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
- 3. Unit shall operate between 0 C and 50 C.
- 4. Unit shall be UL recognized.

D. Current Switches

- 1. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by chapter 1 article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.
- F. Installation: By trained and experienced mechanics. All work shall be done by the control sub-contractor. All wiring incidental to the control system not shown on the Electrical Drawings or specified in Division 16 shall be provided and installed by the Control Contractor including all interlock control wiring between the various components of the air conditioning system, and all smoke detection system electrical wiring.

3.4 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.5 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division 16 of these specifications. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.
- B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that:
- C. Circuits meet NEC Class 2 (current-limited) requirements. Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.
- D. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.
- E. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- F. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 3

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

m (10 ft) intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 1.5 m (5 ft) intervals or more often to achieve a neat and workmanlike result.

- G. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- H. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.
- I. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- J. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.
- K. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.
- L. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.
- M. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- N. Adhere to Division 16 requirements for installation of raceway.
- O. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- P. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and rooms, liquid-tight, flexible metal conduits shall be used.

3.6 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly down-stream of air flow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.
- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.7 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.
 - 1. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
 - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 - 3. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.8 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1-cm (1/2") letters on nameplates.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.
 - 1. boards or point modules shall be required to implement use of these spare points.

3.9 CLEANING

- A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.
- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.10 TRAINING

- A. Train the designated staff of Owner's representative and Owner for 4-hours minimum to enable them to proficiently operate the system; create, modify, and delete programming; add, remove, and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.
- B. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

3.11 ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of the Engineer.

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

SECTION 15940 - SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.
- B. See Division 15 Section "HVAC Instrumentation and Controls" for control equipment and devices and for submittal requirements.

1.2 CONTROL SEQUENCES

- A. Split System Heat Pump Units:
 - 1. Refer to "Mechanical Controls" plans for sequence of operation.
- B. Ductless Air Conditioning/Heat Pump Units:
 - 1. Refer to "Mechanical Controls" plans for sequence of operation.
- C. Exhaust Fans:
 - 1. Refer to "Exhaust Fan Schedule" for control and interlocking.
- D. Fire Alarm Control: When the fire alarm system is activated, all mechanical systems shall be shut down. Upon deactivation of fire alarm system, HVAC system shall automatically restart.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

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SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

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. Balancing Air Systems:
 - a. Air systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB reports.
- C. Sample report forms.
- D. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 - 1. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. TAB Conference: Meet with Construction Manager on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

1.6 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, engage one of the following:

- 1. Dynamic Analysis-Pensacola

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Southern Balance-Pensacola
3. System Analysis-Mobile
4. First Coast Test and Balance-Jacksonville

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 15815 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 23 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 15815 "Metal Ducts."

3.6 PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at outlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- C. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air for cooling coils.
 - 3. Airflow.
 - 4. Air pressures drop.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Measure, adjust, and record the following data for each electric heating coil:
1. Nameplate data.
 2. Airflow.
 3. Entering- and leaving-air temperature at full load.
 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 5. Calculated kilowatt at full load.
 6. Fuse or circuit-breaker rating for overload protection.
- C. Measure, adjust, and record the following data for each refrigerant coil:
1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.
 4. Air pressures drop.
 5. Refrigerant suction pressure and temperature.

3.10 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus, or minus 10 percent.
 2. Air Outlets and Inlets: Plus, or minus 10 percent.
 3. Heating-Water Flow Rate: Plus, or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus, or minus 10 percent.

3.11 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. VFD settings for variable-air-volume systems.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Terminal units.
 5. Balancing stations.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

6. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches (mm), and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
2. Motor Data:
 - a. Motor makes, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg (Pa).
 - e. Filter static-pressure differential in inches wg (Pa).
 - f. Preheat-coil static-pressure differential in inches wg (Pa).
 - g. Cooling-coil static-pressure differential in inches wg (Pa).
 - h. Heating-coil static-pressure differential in inches wg (Pa).
 - i. Outdoor airflow in cfm (L/s).
 - j. Return airflow in cfm (L/s).
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. VFD setting.

F. Apparatus-Coil Test Reports:

1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- d. Number of rows.
- e. Fin spacing in fins per inch (mm) o.c.
- f. Make and model number.
- g. Face area in sq. ft. (sq. m).
- h. Tube size in NPS (DN).
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Air flow rate in cfm (L/s).
- b. Average face velocity in fpm (m/s).
- c. Air pressure drop in inches wg (Pa).
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
- e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
- f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
- g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
- h. Refrigerant expansion valve and refrigerant types.
- i. Refrigerant suction pressure in psig (kPa).
- j. Refrigerant suction temperature in deg F (deg C).

G. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

- a. System identification.
- b. Location.
- c. Coil identification.
- d. Capacity in Btu/h (kW).
- e. Number of stages.
- f. Connected volts, phase, and hertz.
- g. Rated amperage.
- h. Air flow rate in cfm (L/s).
- i. Face area in sq. ft. (sq. m).
- j. Minimum face velocity in fpm (m/s).

2. Test Data (Indicated and Actual Values):

- a. Heat output in Btu/h (kW).
- b. Air flow rate in cfm (L/s).
- c. Air velocity in fpm (m/s).
- d. Entering-air temperature in deg F (deg C).
- e. Leaving-air temperature in deg F (deg C).
- f. Voltage at each connection.
- g. Amperage for each phase.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches (mm), and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg (Pa).
 - e. Suction static pressure in inches wg (Pa).
- I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F (deg C).
 - d. Duct static pressure in inches wg (Pa).
 - e. Duct size in inches (mm).
 - f. Duct area in sq. ft. (sq. m).
 - g. Indicated air flow rate in cfm (L/s).
 - h. Indicated velocity in fpm (m/s).
 - i. Actual air flow rate in cfm (L/s).
 - j. Actual average velocity in fpm (m/s).
 - k. Barometric pressure in psig (Pa).
- J. Instrument Calibration Reports:
 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.13 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Commissioning Authority.
3. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- #### **A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.**

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

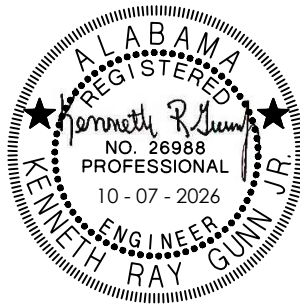
A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

Mechanical

LATHAN MCKEE PROJECT NO. MKA 24-261

DIVISION 16

ELECTRICAL



Prepared by Kenneth R. Gunn Jr. P.E.

SECTION 16100
ELECTRICAL

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 work specified in this section.

1.02. QUALIFICATIONS OF ELECTRICAL CONTRACTORS:

- A. Electrical contractor must be properly established as an electrical contractor by the State of Alabama. Electrical contractor shall have had previous experience in the satisfactory installation of at least three systems of this type and size in the State of Alabama.

1.03. CODES, PERMITS AND INSPECTIONS:

- A. Comply with applicable laws of the community, with latest edition of National Electrical Code (NEC), NFC 70, and the International Building Code (IBCC) or the edition adopted by the local authority having jurisdiction, where not in conflict with those laws, and with the service rules of the local utility company.
- B. Obtain and pay for all permits and deposits and arrange for inspections as required.
- C. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.04. MATERIALS:

- A. All materials shall be new, and UL approved where a standard has been established.
- B. Manufacturers' names and model numbers shown on the plans and in the specifications are given to indicate the type and general quality of items to be provided. Equal products by other manufacturers will be accepted.
- C. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect/Engineer has been presented in writing, with samples if requested by the Architect/Engineer. All prior approvals must have the approval of the engineer of record at the offices of Gunn and Associates, P.C. located at 3102 Highway 14, Millbrook, AL 36054, Phone: 334-285-1273
- D. All proposed substitutions shall be approved in writing at least ten (10) days prior to the bid date.
- E. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

1.05. WORKMANSHIP:

- A. Execute all work so as to present a neat and workmanlike appearance when completed.

1.06. DESCRIPTION OF WORK:

- A. Furnish all labor and materials required to complete the electrical work indicated on the drawings or herein specified. Major work included in Section 16 shall be:
- B. Prior to bid it is the contractor's responsibility to re-affirm with the power company the service requirements to the facility as indicated on the electrical drawings. If any changes or additions to the service lateral installation indicated on the drawings is required by the utility company the

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

contractor shall include the cost of these changes in his/her bid. Additionally, any/all charges for electrical service to the facility (aid-to-construction) by the utility company shall be included in the contractor's bid price.

- C. Remove or relocate all electrical or electronic 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 complete project or any code pertaining thereto.
- D. Furnish and install a complete electrical light and power system including but not limited to the connection of all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, lighting fixtures, switches, and/or other equipment forming part of the electrical system.
- E. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, backboard, and service entrance conduit for the communications system.
- F. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, Category 6 cables, backboards, patch panels, and fiber optic cables and patch panels for the Data System.
- G. Connect all electrical equipment whether furnished by this contractor or by others.
- H. Furnish and install all disconnect switches not included as an integral part of equipment.
- I. Furnish and install a complete Lighting Control System.
- J. Furnish and install a complete Fire Alarm System compliant with applicable provisions of the International Building Code (IBC) and the National Fire Protection Association (NFPA) Standard No. 72.
- K. Complete the alterations, additions, and renovations to the electrical system in the existing building as specified herein or as shown on the drawings.
- L. Procure and pay for permits and certifications as required by local and state ordinances and Fire Underwriters certificate of inspection.
- M. Visit the site and determine conditions that affect this contract. Failure to do so will in no way relieve the Contractor of his responsibility under his contract.
- N. Submit to the Architect a certificate of final inspection from local and/or state inspection authorities.
- O. Establish and maintain temporary electrical services for construction purposes.

1.07. DRAWINGS AND SPECIFICATIONS:

- A. This Contractor shall examine drawings and Specifications relating to the work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid and prior to the start of any construction.
- B. Drawings and Specifications shall be considered as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from the Architect in advance of bidding; otherwise incorporate the more stringent conditions into the bid price.
- C. Omissions from the drawings and specifications or the mis-description of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omissions and details of work; they shall be performed as if fully and correctly set forth and described in the drawings and specifications.
- D. The drawings indicate diagrammatically the extent, general character, and the approximate location of the work to be performed. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, locations of conduit, fixtures, outlets, and

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

equipment with the detailed architectural, structural, and mechanical drawings, and lay out work so as to fit in with ceiling grids, ductwork, sprinkler piping and heads, and other parts. Take finished dimensions at the job site in preference to using scale dimensions.

- E. Where the work is indicated but with minor details omitted, furnish and install the work complete so as to perform its intended functions.
- F. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- G. Except as noted above, make no changes in or deviations from the work as shown or specified except on written order of the Architect.

1.08. EXISTING CONDITIONS:

- A. Before submitting a bid, visit the site and ascertain all existing conditions.
- B. Make such adjustments in work as are required by the actual conditions encountered.
- C. No consideration will be given after bid opening for alleged misunderstandings regarding utility connections, integration of work with existing system, or other existing conditions.

1.09. SUBMITTALS:

- A. Follow procedure outlined in Division 1.
- B. Submittals shall be bound together and shall include a coversheet indicating the following:
 - 1. Project name
 - 2. Trade contractor's name
 - 3. Supplier's name
 - 4. Name and phone number of supplier's contact person
 - 5. A list of each item submitted with manufacturers' names and model numbers.
- C. Within 20 days of award of contract and prior to beginning any work on the project submit six (6) copies of manufacturer's drawings/data sheets for the following items to the Engineer for review:
 - 1. Conductors
 - 2. Cable Pulling tensions. Provide cable pull tension calculations (lateral and longitudinal) on all underground cable runs over 150 feet for cables sized #1 and larger. Provide one line diagram indicating pulling tensions on each run and number and size of each pull box along anticipated route. Calculations shall include changes in direction or elevation of feeder runs.
 - 3. Wiring Devices
 - 4. Conduit Wrapping Tape
 - 5. Panelboards
 - 6. Power system breaker coordination. Submit proper breaker settings recommendations with breaker coordination study.
 - 7. Contractor shall coordinate with mechanical/plumbing shop drawings prior to submitting power package to engineer. Adjust overcurrent devices accordingly.
 - 8. Disconnect Switches
 - 9. Fire Stopping
 - 10. Lighting Control System: Include conduit and cable layout, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Furnish the Owner one set of as built drawings at completion of the project. Coordinate with lighting control riser on drawings for further shop drawings requirements.
 - 11. Lighting Fixtures (include photometric data for each fixture)
 - 12. Fixture Support Equipment
 - 13. Lighting Standards (Poles)

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

14. Data/Telecommunications System
 - a. Cable
 - b. Equipment
 - c. Installer qualifications
 - d. Makes and Model Numbers of Testing Equipment to be used.
 15. Secondary Surge Arresters
 16. Transient Voltage Surge Suppressors(Surge Protective Devices)
 17. **Fire Alarm System: Include conduit and cable layout, battery calculations, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Additionally, the contractor or his/her fire alarm system vendor shall provide audibility calculations indicating compliance with all applicable provisions of NFPA 72 and the IBC. The contract drawings indicate a minimum design required to comply with applicable codes. However, since devices vary from manufacturer to manufacturer the contractor shall be responsible for furnishing any/all additional devices as required to provide audibility and visibility levels that comply with applicable sections of NFPA 72 and IBC. Furnish the Owner one set of as built drawings at completion of the project. Provide a copy of the fire alarm contractor's State Fire Marshal's Permit with the submittals for approval.**
 18. J-Hooks
- D. Submit samples upon request.
 - E. The Contractor is responsible for verifying all quantities and for verifying and coordinating dimensional data with the available space for items other than the basis of design.
 - F. **Provide a ½"= 1'- 0" scale drawing of all electrical rooms containing more than a single panelboard section or containing a panelboard and other electrical and/or mechanical equipment. These drawings shall be submitted along with equipment data sheets. Note we will no longer review submittals that does not have this information. Any delay will be the responsibility of the contractor for not submitting these drawings of the electrical rooms. Power submittals will be returned rejected without these drawings.**
 - G. The contractor shall review and approve or make appropriate notations on each item prior to submittal to the architect. Submittals without contractor's approval will be rejected.
 - H. Submittal reviews will be performed up to two times to review material submitted by contractor. Gunn & Associates will charge a review fee of a \$1,000 to review submittals starting the third time submitted. If contractor needs Gunn & Associates, P.C. to perform another review of material after submittals have been submitted and approved to change manufacturers. A review cost of \$1,000 per review. Payment must be received by Gunn & Associates prior to scheduling any additional reviews.

1.10. COORDINATION OF SERVICE WITH OTHER TRADES:

- A. It shall be the responsibility of the Electrical Contractor to coordinate the electrical service characteristics to each piece of electrically operated equipment with all trades providing electrically operated equipment.
- B. Within ten (10) working days of notification to proceed with construction from the Architect, the Electrical Contractor shall notify, in writing, all trades providing electrically operated equipment the characteristic of the electrical power being supplied to each piece of electrically operated equipment.
- C. A copy of this notification shall be provided to the General Contractor and the Architect.
- D. Be informed as to equipment being furnished by other trades, but not liable for added cost incurred by equipment substitutions made by others which require excess electrical wiring or equipment above that indicated on drawings or specified.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

E. The contractor providing the equipment shall be responsible for the additional costs.

1.11. PROGRESS OF WORK:

- A. Schedule work as necessary to cooperate with other trades, Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.

1.12. PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION:

- A. Take all precautions necessary to provide safety and protection to persons and the protection of materials and property.
- B. Protect items of equipment from stains, 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.
- C. Live panelboards, outlets, switches, motor control equipment, junction boxes, etc., shall be protected against contact of live parts and conductors by personnel.

1.13. CLEANING UP:

- A. During the progress of work, keep the Owner's premises in a neat and orderly condition, free from accumulation of debris resulting from this work. At the completion of the work, remove all material, scrap, etc. not a part of this Contract.

1.14. AS-BUILT DRAWINGS, AND OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. Prior to the Final Acceptance Inspection the Contractor shall turn over to the Architect one set of reproducible "as built" drawings, including corrected fire alarm system shop drawings, three (3) sets of all equipment catalogs and maintenance data, manufacturers' warranties, and three (3) sets of shop drawings on all equipment.

1.15. TESTING:

- A. Upon completion of the work, conduct a thorough test in the presence of Architect or his representative, and demonstrate that all systems are in perfect working condition.

1.16. INSPECTIONS:

- A. The contractor shall have all systems ready for operation and an electrician available to remove panel fronts, coverplates, fixture doors, etc., at the final inspection and any other scheduled inspections.
- B. It is the contractor's responsibility to have the job ready for inspections when they are scheduled. We will perform inspections as required by our contract. If project is not ready during inspection and requires a re-inspection by Gunn & Associates, then the contractor shall pay Gunn & Associates, P.C. for the re-inspection. The payment shall be made directly to Gunn & Associates, P.C. in the amount to be determined by engineer. Not to exceed \$1,500 for single re-inspection fee. Payment must be received by Gunn & Associates prior to scheduling re-inspection.
- C. Inspections for Temporary or Permanent Power required by any utility companies are not in our scope of work. If contractor needs Gunn & Associates, P.C. to perform inspections, contractor must include an inspection cost of \$1,000 per inspection in their base bid. Payment must be received by Gunn & Associates prior to scheduling inspection.

1.17. DEMONSTRATION:

- A. By on-off, stop-start operation, demonstrate to the Owner or his representative, the use, working, resetting, and adjusting of each and every system. Submit statement initialed by the Owner that such demonstration has been made.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

1.18. WARRANTY:

- A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material that may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final to general contractor. Provide the owner with two bound copies of all manufacturers' warranties.
- B. Data and Telecommunications system cabling shall be warranted for a minimum of 15 years.

1.19. TEMPORARY SYSTEMS:

- A. The Electrical Contractor shall be responsible for furnishing and installing equipment and materials necessary for providing electrical power and lighting where needed for the construction of the project.
- B. Electrical Contractor will be responsible for paying for and providing temporary construction power and lighting for entire job site. Coordinate with local jurisdictions and utility companies and pay all fees necessary to get temporary power to the job site. General Contractor shall be responsible for all monthly utility cost for duration of project or date of substantial completion.

1.20. SERVICE INTERRUPTION CLEARANCE WITH OWNER:

- A. Before submitting a proposal, check with the Owner concerning interruption of service to the existing electrical systems. No interruption shall be made except at such time and for such duration as approved by the Owner. The Contractor's bid shall include all necessary over-time and weekend work.

1.21. DEFINITIONS:

- "AWG" - American Wire Gauge
- "ADA" - Americans with Disabilities Act
- "As required" - Any and all items required to complete the installation of an item so as to perform its intended function.
- "Circuiting" - Conductors, raceways, raceway fittings, and associated hardware.
- "EMT" - Electrical Metallic Tubing, "thin wall"
- "IBC" - International Building Code
- "Install" - furnish, install, and make all necessary connections to and/or for the item(s) indicated or specified.
- "NEC" - National Electrical Code, ANSI/NFPA 70, latest edition or the edition adopted by the authority having jurisdiction.
- "Necessary" - Any and all items required to complete the installation of an item so as to perform its intended function.
- "NEMA" - National Electrical Manufacturers' Association
- "NFPA" - National Fire Protection Association
- "PVC Conduit" - Rigid Nonmetallic Polyvinyl Chloride conduit
- "RGS Conduit" - Rigid galvanized steel conduit
- "UL" - Underwriters' Laboratories, Inc.

PART 2 - MATERIALS

2.01. GENERAL:

- A. This section includes all basic materials for raceways, fittings, busways, conductors, panelboards, switchboards, lighting fixtures and accessories, etc., as required for a complete installation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- B. All materials shall be new and listed by the Underwriters Laboratories. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect has been presented in writing, with samples if requested by the Architect.
- C. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

2.02. CONDUITS:

- A. Rigid Metal (Galvanized Steel-RGS) Conduit: Rigid metal conduit shall be mild steel piping, galvanized inside and outside, and conform to ASA Specification 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.
- B. Intermediate Metal Conduit (IMC): IMC shall be hot dipped galvanized inside and outside and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.
- C. Electrical Metallic Tubing (EMT): EMT shall be high grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specifications 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.
- D. Rigid Nonmetallic Conduit (PVC): PVC conduit where exposed shall be high impact Schedule 80; below ground and below or in slab PVC shall be of high impact Schedule 40 PVC and shall conform to Underwriters' Laboratories Standard UL-651. By Carlon, Kraley Pittsburgh, R.G. Sloan or Southwestern.
- E. Rigid Aluminum: Rigid Aluminum conduit shall be manufactured from 6063, t-1 aluminum alloy and shall meet the requirements of Federal Spec. WW-C-540c and ANSI C80.5 and shall be U.L. listed in accordance with UL-6. Equal to products by V.A.W. of America.

2.03. COUPLINGS, FITTINGS, AND CONNECTORS:

- A. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Racor, or Republic.
- B. EMT: EMT fittings shall be all steel type setscrew or insulated throat compression type. Pressure indented or slip fit type will not be accepted. All connectors to be insulated. By Appleton, Efcor, Racor Steel City, or Thomas & Betts.
- C. PVC: PVC fittings shall be of high impact PVC Schedule 40 or Schedule 80 to match the installed conduit. Joints shall be made with PVC solvent cement as recommended by manufacturer. By Pittsburgh, R.G. Sloan or Carlon.
- D. Rigid Aluminum: Fittings used with Rigid Aluminum conduit shall be formed of the same alloy as the conduit or shall be copper free cast aluminum unless specifically indicated otherwise.

2.04. CONDUIT BODIES:

- A. Conduit bodies shall be malleable iron except in kitchen, dishwashing, and waste water treatment areas conduit bodies shall be copper free cast aluminum with stamped aluminum covers.
- B. Covers shall be screw retained with wedge nut or threaded body. Covers on bodies installed outdoors shall be approved and rated for installation outdoors.
- C. Bodies shall comply with NEC 370 and 373.
- D. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Racor, or Republic.
- E. Conduit cannot be used as ground. Provide separate insulated green grounding wire.

2.05. BUSHINGS:

- A. Bushings up to and including 1" shall have a tapered throat.
- B. Bushings 1-1/4" and larger shall be the insulating type.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- C. Grounding bushings shall be specification grade insulated grounding type bushings with tin plated copper grounding saddles and shall be equal to O-Z/Gedney Type BLG or HBLG.
- D. Bushings shall be zinc plated malleable iron or copper free cast aluminum.
- E. Bushings for terminating Data, Telecommunications, control, CATV, and similar conduits above ceilings and at backboards may be PVC or Polyethylene insulating bushings equal to those manufactured by Arlington Industries and Bridgeport Fittings.

2.06. EXPANSION FITTINGS:

- A. Conduit Expansion Joints shall be UL Listed.
- B. Expansion joints in rigid metal conduits shall consist of a threaded malleable iron body, pressure bushing, watertight packing, pressure ring, gasket, insulating bushing, and external grounding jumper, and shall be equal to O-Z Gedney Type AX with Type BJ bonding jumper.
- C. Expansion joints for EMT conduit shall be same as above with additional EMT couplings and connectors and shall be equal to O-Z Gedney Type TX with Type BJ bonding jumper.
- D. Expansion joints in PVC conduit shall be equal to Carlon Series E945.
- E. Expansion joints shall provide a minimum of 4" of conduit movement.

2.07. BELOW GRADE THRU WALL WATER SEALS:

- A. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be seal systems by O-Z/Gedney or The Metraflex Company.
- B. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be Metraseal thru wall water seals by The Metraflex Company.

2.08. CONDUIT ACCESSORIES:

- A. Conduit clamps and supports for metallic conduit shall be galvanized steel by Efcor, Steel City, or Mineralac. Conduit fittings by Appleton, Crouse-Hinds, O-Z/Gedney, Pyle-National or approved equal.
- B. Conduit clamps and supports for nonmetallic conduit shall be nonmetallic high impact PVC by Carlon, Pittsburg, or Sloan.
- C. Conduit clamps for aluminum conduits shall be stainless steel or cast copper free aluminum with stainless steel fasteners.

2.09. FLEXIBLE CONDUIT:

- A. Liquidtight flexible metal conduit:
 - 1. Neoprene-jacketed liquidtight flexible metal conduit.
 - 2. Equal to Anaconda Sealtite.

2.10. ELECTRICAL TAPES:

- A. General use electrical tape shall be 8 mil (.008") thick, minimum, premium grade, pressure sensitive, flame retardant, vinyl electrical tape meeting UL 510, ASTM-D-3005, and MIL-I-24391C. The tape shall be equal to 3M No. 88 or Plymouth Premium 85 CW.
- B. Rubber tape used as primary tape shall be a 30 mil (.030") thick, minimum self-amalgamating, low voltage rubber tape rated for use through 600 V. Rubber tape shall be equal to 3M No. 2150 or Plymouth 122 Rubber Tape.
- C. Electrical filler tape shall be a 125 mil (.125") thick, minimum, self-amalgamating, low voltage insulating compound rated for use through 5 kV. Filler tape shall be equal to 3M SCOTCHFILL or Plymouth 125 Electrical Filler Tape.

2.11. PIPE WRAPPING TAPE:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- A. Pipe wrapping tape shall be a 10 mil (.010") thick, minimum, pressure sensitive, vinyl tape manufactured for pipe wrapping applications.
- B. The tape shall be UV, bacteria, and fungus resistant.
- C. The manufacturer's name and tape type shall be printed on the back of the tape.
- D. Pipe wrapping tape shall be equal to Plymouth Rubber Co. PLYWRAP 11, or 3M No. 50.

2.12. WIRE NUTS:

- A. Wire nuts for conductor splicing shall be winged type connectors with a square, plated steel spring and flame-retardant thermoplastic shell.
- B. The connector shall be rated for the number and size conductors being connected.
- C. The Wire Nuts shall be rated for 105°C. And UL 486C listed.
- D. Wire nuts shall be equal to connectors by Ideal/Buchanan, 3M/Scotch, or T & B,

2.13. SPLIT BOLT CONNECTORS:

- A. Split bolt connectors for splicing conductors shall be UL 486A listed, shall be tin plated copper, and shall have a hexagonal head and nut.
- B. Split bolt connectors for conductors sized AWG #4 and larger shall have a serrated spacer bar between conductors.
- C. Split bolt connectors for splicing conductors AWG #12 through #6 shall be equal to Ilco Type SEL and Type SK for AWG #4 and larger conductors.

2.14. MULTI-TAP CONNECTORS:

- A. Multi-tap connectors shall be insulated type
- B. Multi-tap connectors shall be rated for the conductor sizes indicated on the drawings.
- C. The connectors shall be provided for the number of conductors indicated, including any future taps shown, plus a minimum of one additional tap.
- D. Multi-tap connectors shall be equal to Ilco Type PCT or Type PED-CP.

2.15. WATERPROOF WIRE JOINTS:

- A. Splices made below grade shall be made connectors, UL listed as waterproof, for below grade applications.
- B. Waterproof Twist On Connectors for Up to 2#6 W/1#12 tap Conductors: Single piece wire nut pre-filled with silicone sealant. Sealant shall be rated for 45-400 degrees F. Connectors shall have same insulation rating as conductors. Sizes shall be available for connecting up to 2 #6 w/1#12 tap conductors. Connectors shall be UL listed as waterproof for below grade applications and equal to Ideal Buchanan B-Cap Twist and Seal Wire Connectors, King Safety Products, Tyco/Raychem GelCap SL, or equal.
- C. Waterproof Stub Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for feeder wire sizes #14 through #2/0 and tap wire sizes of #14 through #6. Connectors shall be UL listed as waterproof for below grade applications and equal to Tyco/Raychem GelCap SL.
- D. Waterproof In-line Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for wire sizes #6 through #350 kcm. Connectors shall be equal to Tyco/Raychem GTAP.
- E. Waterproof Splice Kit for Conductors above #2/0: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

shall be rated for wire sizes #14 through #2/0. Connectors shall be equal to Tyco/Raychem GHFC.

2.16. PLASTIC MARKING TAPE FOR MARKING UNDERGROUND CABLES AND CONDUITS:

- A. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch.
- B. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise.
- C. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep.
- D. The tape shall be of a type specifically manufactured for marking and locating underground utilities.
- E. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion.
- F. Tape color shall be as specified in the table below and shall bear a continuous printed inscription describing the specific utility.

Red:	Electric
Orange:	Data, Telephone, Television,

2.17. FIRE STOPPING:

- A. Fire sealant shall be intumescent caulk, putty, sheet and/or wrap/strip as required to attain the proper rating.
- B. Caulk shall be equal to 3M CP25 N/S and/or S/L.
- C. Putty shall be equal to 3M Fire Barrier Moldable Putty.
- D. Sheet equal to 3M CS195.
- E. Wrap/strip equal to 3M FS195.
- F. Equal products by Dow Corning, Hilti, and Metacaulk will be accepted.

2.18. SPACERS FOR CONCRETE ENCASED ELECTRICAL DUCTS:

- A. Spacers shall be interlocking high impact plastic assemblies, which provide horizontal and vertical spacing, and hold the ducts and re-bar, where applicable, in place.
- B. The spacers shall be equal to Carlon Snap-Lok Spacers.

2.19. JUNCTION BOXES (THRU 4-11/16"):

- A. Sheet Metal: To be standard type with knockouts made of hot dipped galvanized steel, By Steel City, Raco, Appleton or approved equal.
- B. Cast: To be type FS, FD, JB, GS or SEH as required for application.

2.20. JUNCTION AND PULL BOXES (LARGER THAN 4-11/16"):

- A. Shall be cast metal for all below grade exterior use and where indicated on plans. All other shall be oil tight, JIC boxes not less than 16 gauge, equal to Hoffman type "CH" boxes.

2.21. PULL BOXES:

- A. Galvanized sheet metal screw-cover type with UL label as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.

2.22. JUNCTION AND TERMINAL BOXES FOR AUXILIARY SYSTEMS:

- A. Junction boxes for auxiliary system circuiting splicing shall be formed of galvanized steel.
- B. Boxes shall have hinged front, locking door(s).
- C. Metal back plates shall be provided for mounting terminal strips or other devices.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- D. Screw terminal strips shall be provided with a minimum of 25 percent spare terminals.
- E. Boxes shall be sized to accommodate the terminal blocks and conductors, providing code required bending space.
- F. Boxes for auxiliary systems shall be manufactured by Austin, E-Box, Hoffman, or Wiegmann.
- G. Provide complete back boxes for all surface mounted devices. Back box shall have knockout on top and bottom as needed. Surface mounted junction boxes with devices mounted to it will not be accepted. Wiremold boxes will be accepted.

2.23. AUXILIARY GUTTERS (WIRING TROUGHS):

- A. Gutters shall be of sizes shown and/or required by the NEC (whichever is larger), constructed of code gauge, galvanized sheet steel, painted ANSI 61 gray.
- B. Gutters shall be UL listed and shall be of NEMA 3R construction in wet or damp locations or shall be as indicated on the drawings.
- C. Gutters shall be as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.

2.24. BASKET CABLE TRAY:

- A. Cable tray for the shall be electroplated zinc, wire type, wall or ceiling mounted type as required, equal to Cablofil of sizes indicated on the plans.

2.25. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:

- A. Strut shall be 1-5/8" except where heavier strut is required to support the load, for rigidity, or where specifically indicated otherwise.
- B. Cold-formed steel, ASTM A 570 or A 446 GR A.
- C. Stainless Steel Strut: Type 304, ASTM A 240.
- D. Hot Dipped Galvanized Steel Strut: Zinc coated after manufacturing operations are complete, ASTM A 123 or A 153
- E. Electro-galvanized Steel Strut: Electrolytically zinc coated, ASTM B 633 Type III SC 1.
- F. Fittings: Same material as strut, ASTM A 575, A 576, A 36, A 635, or A 240.
- G. Zinc Primer: As recommended by strut manufacturer.
- H. Strut Systems shall be as manufactured by B-Line, Erico, Globe, Kindorf, MasterStrut, Power Strut, T&B SuperStrut, or Unistrut.

2.26. OUTLET BOXES:

- A. General: Except as noted, boxes shall be standard hot dipped galvanized steel at least 1-1/2" deep, of metal at least 1/16" thick; sized to accommodate devices and conductors per NEC Article 370; product of Appleton, National, Steel City, or approved equal.
- B. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.
- C. Typical boxes (for switches, receptacles and auxiliary systems):
 - 1. All junction boxes shall be recessed within the confines of the walls unless otherwise noted. Junction boxes shall be accessible by means of a coverplate or a standard junction box cover whichever is appropriate for the installation.
 - 2. 4" square boxes ganged as required. Box volume shall be in accordance with NEC Section 370 – provide extensions as required.
 - 3. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

4. Use 4-11/16" square, 2-1/8" deep boxes where more than 10 conductors enter the boxes. Provide extensions as required to provide volume per NEC.
 5. Where existing walls are furred out with shallow hatch channel and sheet rock then the contractor will be required to use a shallow junction as required.
 6. All exposed junction boxes for receptacles, communications devices, switches, and fire alarm devices shall be provided with back boxes. Do not use standard stamped steel junction boxes when exposed. No exposed edges of device plates will be allowed. No knockouts on the side of the box. Boxes shall be similar to Wiremold 500 & 700 Series or FS boxes. The wall plates will not be allowed to have overlap plates.
- D. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover.
- E. Multiple Outlet Floor Boxes:
1. Floor boxes shall be multi-outlet type providing space for four separate services for duplex outlets and/or Data/Telecommunications outlets.
 2. Floor boxes shall be provided with covers equal to Walker S36CCTCAL(BK)(BS) flush access hatch with carpet trim for carpeted floors and S36BBTCAL(BK)(BS) trim for vinyl covered floors.
 3. Floor boxes shall be provided with 20-amp duplex grounding duplex receptacles, isolated ground receptacles, and Data/Telecommunications outlets as indicated on the drawings.
 4. Data outlets shall be modular type capable of housing up to six (6) Cat 5e jacks. Boxes shall be provided with two (2) active jacks unless indicated otherwise on the drawings. Provide with communications bracket(s) equal to Wiremold #RFB4-LPB.
 5. Provide blank plates for all unused openings.
 6. The boxes shall be equal to what is specified on drawings.
- F. Boxes used with Exposed Conduit: 4" square utility boxes.
- G. Exterior Boxes: Galvanized cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney or approved equal will be accepted.
- H. Exterior Boxes: All receptacle boxes shall be recessed unless specifically called out not to be. This includes exterior receptacles in all masonry type walls including but not limited to Pre-cast, Brick, Block, etc.
- I. Boxes used with Recessed Lighting Fixtures: Provide a 4" square box with blank cover.
- J. Boxes in Dry Wall Construction: Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi-gang devices occur).
- K. Boxes installed exposed in kitchen and dishwashing areas shall be copper free cast aluminum with gasketed cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.
- L. All junction boxes shall be mounted in accessible locations. Provide access panels as needed in hard or detention surfaces to access.

2.27. CONDUCTORS AND CABLES:

- A. Power Conductors
1. The ungrounded conductors (phase) and the grounded conductor (neutral) of each voltage system being installed shall be phase identified the full length of the conductor with the color characteristics manufactured in the insulation of cable from the cable manufacturer. Required color cable will then be installed for the specific voltage system as identified in these specifications.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

2. All conductors shall be copper with not less than 98% conductivity and with current carrying capacities per N.E.C. for 60°C. for sizes through #1 AWG and 75°C for conductors #1/0 and above.
3. All conductors shall have manufacturer's name, type insulation, and conductor size imprinted on jacket at regular intervals.
4. Conductors of size #10 and smaller shall be solid copper conductors with 600-volt type THHN or THWN insulation.
5. Conductors of size #8 and larger shall be stranded copper conductors with 600-volt type THHN or THWN insulation.
6. All motor branch circuits, HVAC, and plumbing equipment shall be stranded copper conductors with 600-volt type RHH-RHW insulation.
7. All conductors installed in conduit below grade shall be rated for wet location.
8. Manufacturer: Conductors shall be products of GE, Triangle, Phelps- Dodge, Anaconda, Rome, Habirshaw, General Cable, or approved equal.
9. Fixture Wire:
 - a. Conductors feeding into fixtures, other than fluorescent fixtures, of 300 watts or less shall be #14, 200°C., type SF-2, for fixtures of more than 300 watts #12, 200 °C., type SF-2 shall be used.
 - b. Conductors pulled through fluorescent fixtures shall have Type TFN or TFFN fixture wire, rated 90oC.
 - c. Conductors shall be by Dodge, Anaconda, Rome General Cable or Southwire.
- B. Control and Signal Wire: Conductor type TFF, minimum size #16 copper and fully color-coded, shall be used. Conductors shall be by Anaconda, Houston Wire & Cable, General Cable, Phelps Dodge, Rome, or Southwire.

2.28. WIRING DEVICES:

- A. General: Manufacturer's and catalog numbers listed are used to establish style, type and quality. Unless otherwise indicated on drawings, all wiring devices shall be UL listed, side-wired specification grade.
- B. Manufacturers: Equal devices by Hubbell, Leviton, Eaton and P & S will be accepted. All devices shall have plaster ears.
- C. Wall switches: 120/277V, 20A, AC, flush enclosed, quiet type switches with thermoplastic body and polycarbonate toggles. Switches shall meet Federal Specification WS-896. Switches shall be, Hubbell 1200 series, Leviton 1200 series, Eaton AH1200 series or P & S PS20AC series single pole, 2-pole, 3-way, or 4-way as required.
- D. Duplex receptacles (general purpose): 125V/20A flush duplex back and side wired hard use specification grade receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal and break-off fins for converting to 2-circuit use. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S 5362, Hubbell CR20, Eaton 5362 or Leviton 5362.
- E. Tamper Resistant Duplex receptacles, 125V/20A flush duplex, hospital grade, tamper resistant receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S TR62-H, Eaton TR8300 or Hubbell HBL8300SGDuplex combination 125/250-volt receptacles: receptacles shall be 20 amp, combination 125 volt (NEMA 5-20R)/250-volt (NEMA 6-20R) grounding receptacles.
- F. Isolated Ground Receptacles: 125V/20A, NEMA 5-20R configuration, equal to Hubbell #IG5362, Eaton AHIG5362, Leviton #5362-1g, or P & S IG6300. IG receptacles shall be same color as general-purpose receptacles with an orange triangle on the face – fully orange colored receptacles shall not be acceptable.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- G. Ground Fault Circuit Interrupt Receptacles: 125V/20-amp ground fault circuit interrupting receptacle for personnel protection, NEMA 5-20R configuration, Equal to Hubbell #GF5362, Leviton #6599, Eaton SGF20 or P & S 2091. Each GFCI symbol on drawing indicates a GFCI type receptacle. Do not through-wire non-GFCI receptacles from GFCI receptacles where ground fault protection is required. All exterior receptacles shall be ground fault interrupting type with weatherproof coverplates.
- H. Faceless Ground Fault Circuit Interrupter: 125V, 20-amp ground fault circuit interrupter UL listed for personnel protection, equal to Hubbell GFR5350 Series, Leviton 6490, Eaton SGFD20 or Pass & Seymour Series 2081.
- I. Single Receptacles: Flush Bakelite receptacles with side wiring and grounding terminal, voltage, amperage, and configuration as required for circuit indicated.
- J. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs.
- K. Multioutlet Assemblies, Strip outlets, 15 amp, 125V, grounded, outlets on 6" centers, equal to Wiremold V20GBx06. Where x = length indicated on the drawings.
- L. Plugs for kitchen equipment to be plugged into wall mounted straight blade receptacles shall be angled type.
- M. Wiring devices shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and gray. Devices connected to the emergency generator shall be red in color.
- N. All receptacles shall be tamper-proof type receptacles where required by the National Electrical Code.

2.29. DEVICE PLATES:

- A. Type appropriate for the associated wiring device, equal to Sierra Stainless Steel Smoothline. Device plates shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and stainless steel. Provide single plate of proper gang where more than one device occurs (do not gang dimmers with rocker switches).
- B. Damp Location: 20 amp, 125 and 250-volt receptacles - Covers shall be weatherproof when plugs are not installed, provide cast aluminum weatherproof coverplates with single lift cover and gasket equal to Hubbell CWP26H.
- C. Wet Locations, 20 amp, 125 and 250-volt receptacles: Covers shall be weatherproof In-Use covers, rated NEMA 3R when in use and shall be constructed of cast aluminum with sealing gasket. Covers shall be equal to products by Hubbell, Leviton, Steel City, T & B, and Taymac.
- D. Coverplates for exposed cast aluminum boxes in kitchen and dishwashing areas shall be cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.
- E. Color: Wiring device cover plates shall be of color as indicated on drawings or directed by Architect. Devices must be available in ivory, brown, black, white, gray, and stainless steel.
- F. Jumbo and Mini-Jumbo plates will not be accepted.

2.30. OCCUPANCY SENSORS AND ACCESSORIES FOR LIGHTING CONTROL:

- A. Occupancy sensors shall be totally passive in nature, in that the sensors shall not emit or interfere with any other electronic device, or human characteristic. Sensors shall be dual technology, i.e.: Passive Infrared (PIR) and Microphonic.
- B. PIR shall initiate an "on" condition and the PIR or microphones shall maintain the load "on".
- C. Upon detection of human activity by the detector the lights shall come on and a time delay shall be initiated to maintain the lights on for a pre-set time period. The time delay shall be factory set and field adjustable from 30 seconds to 20 minutes.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- D. All devices shall be factory warranted for 5 years.
- E. All sensors shall be low voltage, 12 to 24 volts and shall work in conjunction with remote power packs.
- F. Occupancy sensors shall be as shown on drawings.

2.31. GROUNDING:

- A. Ground Rods shall be $\frac{3}{4}$ " x 10' copperclad steel.
- B. All grounding conductors shall be copper.

2.32. COMMUNICATIONS SYSTEMS:

- A. Qualifications of Communications Systems Installer:
 - 1. The Cable installer sub-contractor shall be properly licensed and established in the business of data and telecommunications systems installation.
 - 2. Data and Telecommunications Cable Installers shall be certified as installers by BiCSi. Proof of Certification shall be provided prior to beginning installation.
 - 3. Cable installers shall be certified by the cable manufacturer and the connectivity hardware manufacturer and the entire structured cabling system covered by a manufacture/installer 15 year, minimum, warranty. Proof of Certification and Warranty agreement shall be provided prior to beginning installation.
- B. Data and Telecommunications Outlets:
 - 1. Data and Telecommunications outlets shall be modular, Category 6 outlets configured for T568B (AT&T) termination. See drawings for model numbers.
 - 2. Modules shall be mounted in brackets that allow use of standard receptacle faceplates. See drawings for model numbers.
 - 3. The face of modules/jacks shall be flush with the face of the coverplate.
 - 4. Each outlet coverplate shall be capable of housing a minimum of four (4) data/telecommunications jacks.
 - 5. Each Phone/Data outlet shall have a minimum of two (2) RJ45 Category 6 jacks installed, one telephone and one data.
 - 6. Wall phone outlets for hanging phones shall have a stainless steel coverplate with integral lugs for modular wall hung phone installation complete with jack. Wall phone outlets shall be equal to Hubbell Series 630 plates.
 - 7. All unused jack ports shall be equipped with matching blank filler.
 - 8. Architect to select color of faceplate.
- C. Data System Patch Panel:
 - 1. Patch Panel:
 - a. See drawings for details.
 - 2. Cable Management Panel:
 - a. See drawings for details.
 - 3. Rack Mounted Fiber Optic Patch Panel:
 - a. See drawings for details.
- D. Data and Telecommunications Racks:
 - 1. Wall Mounted Equipment Rack:
 - a. Wall mounted equipment racks shall be standard 19" wide X 6" deep X 10.5" high hinged front type.
 - b. Wall mounted racks shall accept standard 19" panels.
 - c. Panel frame shall be aluminum with front swing gate.
 - d. Wall mounted equipment racks shall be standard 20.25" wide X 18" deep X 38" high (18 rack units) aluminum framed structures with black finish equal to Ortronics #OR-604045450.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- e. Wall mounted equipment racks shall be standard 20.25" wide X 18" deep X 50" high (26 rack units) aluminum framed structures with black finish equal to Ortronics #OR-604045450.
 - f. The frames shall be predrilled and tapped with #12-24 threaded EIA hole pattern.
- 2. Floor Mounted Racks:
 - a. Floor mounted racks shall be 7 feet high, 19" wide self-supporting racks with standard EIA hole patterns.
 - b. Panel mounting holes shall be 12-24 threaded.
 - c. The rack shall be equal to Ortronics #OR-60400037.
- 3. Fiber Optic Wall Mount Patch Cabinets:
 - a. Fiber Optic Cable Wall Mounted Cabinets shall be fully gasketed, powder coat steel cabinets which accept modular adapter panels for up to 12 multimode terminations.
 - b. Adapters shall be Type LC type.
 - c. Provide 6 or 12 adapter blocks as required.
 - d. Cabinets shall be equal to Ortronics #OR-615SMFC-LX-12P with #OR-615SCDSM3-L adapters.
- 4. Equal products by Systimax or Belden shall be acceptable.
- E. Telecommunications and Data Cables:
 - 1. Cables shall be warranted for a period of 15 years by the manufacturer and installing contractor.
 - 2. Data Cables:
 - a. Data cables shall be as called out on drawings.
 - b. Cable shall be plenum rated where required.
 - c. Cables shall be manufactured by Berk-Tek, Systimax, or Belden.
- F. Warranty: The entire Cat 6 and cabling system shall be warranted in writing by the cable manufacturer and certified contractor for a minimum of 15 years.

2.33. LIGHTING FIXTURES

- A. General:
 - 1. All Lighting Fixtures shall be UL labeled.
 - 2. Fixtures installed in fire rated ceilings or ceiling assemblies shall be rated for installation in fire rated ceilings.
 - 3. Furnish fixtures complete with lamps, ballasts and internal wiring factory installed.
 - 4. Fixtures shall be furnished as specified herein and as shown on the fixture schedule on the plans. Catalog numbers shown are for basic units; furnish all fixtures complete with flexible connections, trim, plaster frames, and all other appurtenances necessary to the installation.
 - 5. Substitutions: Reference to a specific manufacturer's product is made to establish a standard of quality and design, and to give a general description of the basic type desired. Equal products by the listed manufacturers will be accepted subject to the Engineer's approval.
 - 6. It shall be the responsibility of the contractor to verify the exact type ceiling, type fixture mounting and trim, and recessing depth of all recessed fixtures prior to purchasing any fixtures.
 - 7. Stems on stem mounted fixtures shall be approved ball aligner type, swivel 30 degrees from vertical with swivel below canopy. Paint stems the same color as the fixture trim. Stems in unfinished areas may be unpainted conduit.
 - 8. High and low bay fixtures shall be equipped with safety chains. Every suspended fixture in Gymnasium shall have safety chains.
 - 9. Fixtures installed on the exterior of buildings, on poles, or on pedestals shall be rated for wet location installation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

10. All lighting fixtures installed in gymnasiums, hangars or similar use areas shall be provided with wire guard.
- B. Emergency and Exit lighting Fixtures shall be equipped with a Self-testing module which shall perform the following functions:
 1. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.
 2. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. The battery capacity test may be conducted by using a synthetic load.
 3. Manual test switch to simulate a discharge test cycle.
 4. Modules shall have low voltage battery disconnect (LVD) and brownout protection circuit.
 5. All lighting fixtures and exit signs shown as emergency on drawings shall be provided with a minimum 1100 lumen emergency battery ballast capable of 90 minutes of illumination. No exceptions.
- C. Lamps: Type and Lumen Output as scheduled.
 1. LED bulb shape shall comply with ANSI C79.1. Lamp base shall comply with ANSI C81.61.
 2. Minimum CRI of LED lamps shall be 80 with a color temperature as shown on drawings.
 3. Rated life of all LED lamping shall be a minimum of 50,000 hours failure to 75% of lamp output.
 4. LED lamping shall be capable of dimming from 100% to 0%.

2.34. LIGHTING STANDARDS:

- A. Lighting Standards (Poles) shall be as specified on light fixture schedule anchor base poles rated for sustained winds' for the wind chart of this specific job's location and a 1.3 gust factor.
- B. Poles shall be of the length required to provide the scheduled fixture mounting height.
- C. Poles shall be factory predrilled for arm and fixture mounting.
- D. Hand holes shall be provided at the base end of the pole for wiring access. Handholes shall be a minimum of 3" x 5" with gasketed, weatherproof covers and stainless-steel mounting hardware.
- E. A grounding lug shall be provided inside the handhole.
- F. The poles shall be furnished with a dark bronze, corrosion resistant finish, applied after fabrication.
- G. The base plate shall be furnished with slotted holes for pole alignment.
- H. A base cover shall be furnished with the pole with matching finish.
- I. Anchor bolts shall be 36" long.
- J. Contractor shall include concrete bases for all exterior pole mounted and grade mounted lighting.

2.35. PANELBOARDS:

- A. General: All panelboards shall be dead front type manufactured and installed in accordance with UL and NEMA standards and shall carry a UL label. Ampacity, service voltage, and configuration shall be as indicated on drawings. Panelboards shall be clearly marked with ampacity, voltage, and maximum short current ratings.
- B. Manufacturer: Panelboards shall be as manufactured by Cutler-Hammer, Square D, or Siemens.
- C. Enclosure:
 1. Panelboard enclosures shall be as indicated on drawings.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

2. Unless otherwise indicated, all boxes shall be constructed of galvanized (or equivalent rust-resistant) sheet steel with hinged front trim.
 3. Fronts shall be door in door with two lockable latches to open door, lock, and latch. All panelboard locks shall be keyed alike. Piano hinges with screw latches will not be permitted.
 4. Fronts shall be finished with gray baked enamel over a rust-inhibiting phosphatized coating.
 5. All dual section panels shall be equal in size. Sub-Feed circuit breakers will not be allowed to feed second section.
 6. Sub-Feed circuit breakers feeding additional panels or equipment shall be branch mounted.
 7. Provide permanent numbering of the panelboards. Stickers are not considered permanent.
 8. Any panelboard schedule that indicates more than 42 circuits shall be provided in two equally sized panelboards.
 9. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.
- D. Buss Assembly:
1. Bussing shall be copper.
 2. The buss assembly A.I.C. shall be rated as indicated on drawings. Ratings shall be established by heat rise tests, in accordance with UL Standard 67.
 3. All bussing shall accept bolt on circuit breakers.
 4. Current carrying parts of all bussing shall be plated. In lighting and receptacle panels, bussing shall be designed for connection to the branch circuit breakers in the phase sequence format. Distribution panelboards shall be fully bussed.
 5. Ground bars shall be provided in all panelboards.
 6. Neutral bar shall be fully sized with lugs suitable for incoming and outgoing conductors.
 7. Provide insulated ground buss where indicated on the panelboard schedules.
- E. Circuit Breakers:
1. Circuit breakers shall be quick-make, quick-break, thermal magnetic, molded case, bolt on type.
 2. Circuit Breakers shall be numbered and arranged as indicated on the panelboard schedules and/or single line wiring diagrams. Numbers shall be permanently attached to trim.
 3. SWD Circuit Breakers: Single pole circuit breakers rated 15 and 20 amperes and intended to switch 277 volts or less fluorescent lighting loads shall be UL rated for switching duty and shall be marked "SWD".
 4. HACR Circuit Breakers: Circuit breakers 60 amperes or below, 240 volts, 1-, 2-, or 3-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be UL listed as HACR type and shall be marked "Listed HACR Type."
 5. Circuit breakers serving fire alarm systems, dedicated emergency/exit lighting circuits, and area of rescue communications systems shall be equipped with a screw-on, mechanical handle blocking device which locks the circuit breaker in the "ON" position.
 6. Circuit breakers serving circuits in residential bedrooms shall be Arc Fault Interrupting(AFI) type circuit breakers and shall be UL 1699 listed.
- F. Directories:
1. Each panelboard shall be equipped with a metal directory frame with a clear cover welded to the inside of the door.
- G. Equipment Short Circuit Rating: Short Circuit Interrupting Ratings shall be as indicated on the plans and schedules. Unless specifically indicated otherwise all rating are "Fully Rated"

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

capacities. Where no rating is given, the contractor shall verify the available short current with the serving utility and provide equipment rated accordingly.

- H. Lighting panelboard cans shall be a maximum of 20" wide and 5 ¾" deep. Cans of multi-section panelboards shall be the same size.
- I. Provide nameplate as called out on drawings.
- J. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.
- K. All flush mounted panel shall be provided with six (6) ¾" conduit stubbed up above accessible ceiling.
- L. Any circuit breaker serving an elevator shall be shunt trip type with auxiliary contacts.

2.36. DISTRIBUTION PANELBOARDS:

- A. Furnish and install distribution and power panelboards as indicated in the panelboard schedule(s) or single line wiring diagrams and where shown on the plans.
- B. Panelboards shall be dead front, safety type equipped with thermal magnetic, molded case circuit breakers with trip ratings as indicated on the schedule(s).
- C. Panelboard bussing shall be copper.
- D. Panelboard buss structure and main lugs or main breaker(s) shall have the fault current ratings as indicated on the drawings. Ratings shall be established by heat rise tests conducted according to UL Standard UL67.
- E. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other.
- F. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.
- G. An engraved phenolic label shall be permanently attached to the front of the panelboard adjacent to each circuit breaker identifying the load served by the circuit breaker.
- H. Automatic tripping shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is automatically tripped.
- I. Provisions for additional breakers shall be such that no additional connectors or hardware will be required to add breakers.
- J. The panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel shall be as specified in UL Standards. End walls shall be removable. The size of wiring gutters shall be in accordance with the National Electrical Code, NEMA, and UL Standards for panelboards.
- K. Cabinets shall be equipped with four-piece fronts.
- L. The panelboard interior assembly shall be dead front with panelboard front removed.
- M. Main lugs or main breaker shall be barriered on live sides.
- N. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the buss structure opposite the mains shall be barriered.
- O. Circuit breakers serving Fire Alarm Systems, Security Systems, and/or Emergency/Exit lights shall be equipped with mechanical, screw-on type, locking devices. These devices shall not be padlock type devices.
- P. Panelboards shall be listed by Underwriters' Laboratories and to bear UL label. Panelboards shall be rated for use as Service Entrance Equipment where required by the National Electrical Code. Panelboards shall be by Cutler-Hammer, Square D, or Siemens.
- Q. Provide nameplate as called out on drawings.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- R. Any circuit breaker serving an elevator shall be shunt trip type with auxiliary contacts.
- S. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.
- T. All flush mounted panel shall be provided with six (6) ¾" conduit stubbed up above accessible ceiling.
- U. All service entrance main circuit breakers shall be 100% rated.

2.37. SAFETY SWITCHES:

- A. Furnish and install safety switches as indicated on the drawings.
- B. Switches installed on 277/480 volts systems shall be rated for 600 volts and those installed on 120/208 volt or 120/240-volt systems shall be rated for 240 volts.
- C. Switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratory listed. Safety switches shall be Cutler Hammer, Siemens, or Square D.
- D. General Duty disconnects will not be accepted.
- E. Enclosures for switches mounted outdoors shall be NEMA 3R or as indicated on the plans.
- F. Enclosures for switches installed in kitchen and dishwashing areas shall be NEMA 4X stainless steel or as indicated on the plans.
- G. All safety switches for equipment with remote controls shall be equipped with a control circuit disconnect interlock.
- H. Switches shall be lockable in the "ON" and in the "OFF" positions.
- I. Provide each disconnect with a nameplate that indicates equipment name, voltage/phase, and feed from location.
- J. Provide keyed brass locks on all disconnects that is located on the exterior of the building or in any area that is accessible to children or the public. All the brass locks shall be keyed the same and turn over 10 sets of keys to the owner at substantial completion.
- K. Disconnect locations shown on drawings is diagrammatically shown. Disconnects shall be coordinated with other trades and placed in the optimal locations to serve equipment and shall be installed in the least obtrusive location. Disconnects will have to be moved at the cost of the contractor when there is conflicts with NEC clearances, access to space, or servicing of equipment. Architect/Engineer will have final judgment of proper location.
- L. Disconnects serving an elevator shall be NEMA 3R and provided with auxiliary contacts.

2.38. MANUAL MOTOR STARTERS (TUMBLER SWITCH TYPE WITH OVERLOAD PROTECTION):

- A. Starting and thermal overload protection for single phase motors 1/8 Hp to 1 HP shall be provided by manual motor starters with overload units rated as required by the specific motor to be served.
- B. Switches installed for site disconnect switches shall be equipped with padlocking provisions.
- C. Starters shall be by Cutler Hammer, General Electric, or Siemens with NEMA Type 1 enclosure or NEMA Type 3R enclosure where installed outdoors.

2.39. TRANSIENT VOLTAGE SURGE PROTECTORS (SURGE PROTECTIVE DEVICES):

- A. Provide transient voltage surge protectors (Surge Protective Devices) where indicated on the plans. At a minimum provide on all service entrance panelboards/switchboards and any panelboard/switchboards on the secondary side of a dry-type transformer.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- B. Service Entrance Panelboards and at Subpanel Protectors shall be listed and labeled and components recognized in accordance with UL 1283 and UL 1449 Second Edition, including highest fault current of Section 37.3.
- C. All devices shall meet or exceed the following:
 - 1. NEMA LS 1-1992.
 - 2. Minimum surge current capability, single pulse rated, per mode:
 - a. Service Entrance – 100 kA (200 kA per phase)
 - a. Distribution and branch panelboards – 80 kA (160 kA per phase)
 - 3. UL 1449, Second Edition, Listed and Labeled, and Recognized Component Suppressed Voltage Ratings shall not exceed (1.2x50□s, 6kV open circuit and 8x20□s, 500A short circuit test wave forms at end of 6" lead):

Voltage	L-N	L-G	N-G	L-L
208Y/120v	400	400	330	700
480Y/277V	800	800	800	1500
 - 4. Testing shall be done at the end of 6" leads with the complete unit including any fuses and all other components making up the unit.
- D. The devices shall have a minimum EMI/RFI filtering of –50dB at 100kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.
- E. Devices shall utilize MOV's of 25 mm diameter or larger, shall have pilot lights visible on the outside of the enclosure to indicate device operating condition, and shall provide contacts for remote monitoring of device condition.
- F. Devices shall be modular in design with individual module fusing and thermal protection.
- G. Devices shall incorporate visual alarm signals that indicate the failure of a single MOV and total loss of protection.
- H. Wye connected devices shall provide L-L, L-N, L-G, and N-G surge diversion with L-N/L-G bonded at service entrance devices. Delta connected devices shall provide L-L and L-G protection.
- I. Data Line Surge Protectors: Data Line Surge Protectors shall be UL 497B listed and labeled. The units shall be heavy duty devices utilizing a combination of silicone diodes and gas tube technology to provide surge protection.
- J. All devices shall have a minimum warranty period of five years, incorporating unlimited replacement of suppressor parts if they fail during the warranty period.
- K. Transient voltage surge suppressors shall be manufactured by AC Data Systems, Advanced Protection Technologies, Current Technologies, Cutler-Hammer, General Electric, Joslyn, Liebert, or MCG.

2.40. SECONDARY SURGE ARRESTERS:

- A. Secondary surge arresters shall be UL listed under UL Classification (Lightning Protection) Surge Arresters (OWHX).
- B. Surge arresters shall be rated at same voltage and phase configuration as service.
- C. Arresters shall be equal to Cooper Power Systems ASZH Series, Cutler-Hammer, GE Tranquell, Joslyn Electronic Systems, Leviton models as required to match the voltage of the system served.

2.41. FUSES:

- A. General: Fuses shall be UL listed time delay types with a minimum interrupting rating of 100,000 amps symmetrical.
- B. 200 amps and below: Provide Class RK-5 current limiting, time delay, rejection type as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- C. 201 to 600 amps: Class RK-1, current limiting, time delay, rejection type as manufactured by Bussman, Ferraz Shawmut, or Littlefuse.
- D. Above 600 amps: Class L current limiting, time delay, as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.

2.42. LABELING:

- A. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device.
- B. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic 0.125-inch thick, white with black center core.
- C. Provide red laminated plastic label with white center core where indicated.
- D. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core.
- E. Minimum size of nameplates shall be one by 2.5 inches.
- F. Lettering shall be a minimum of 0.25-inch high normal block style.
- G. See Panelboard details for proper labeling of all panelboards.

2.43. PHOTOCELLS, TIME SWITCHES AND CONTACTORS:

- A. Photocells: Units shall have 1" diameter, hermetically sealed, cadmium sulfide sensing cell with 3-prong NEMA locking plug, rated for wet locations. Units shall have built-in time delay. Units shall be equal to Tork 5231 of correct voltage to match load or use with matching receptacle equal to Tork 2421.
- B. Time switches:
 - 1. Unless otherwise indicated on drawings, time switches shall be 24-hour electromechanical type having synchronous motor drive with two single pole double throw contacts rated 20 amps minimum.
 - 2. Unit shall have spring back up, with automatic rewind, capable of providing 16 hours minimum of reserve power upon electric power failure.
 - 3. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors. Enclosures shall be flush mount unless otherwise indicated on drawings.
 - 4. Units shall be Tork 7120L, or equal by Paragon or Sangamo.
 - 5. Time switch(es) shall be digital, seven day format, two channel time switches with 9v lithium battery 30 day back-up and with metal indoor enclosure. The controllers shall be equal to Tork #DW200A-Y.
- C. Contactors: Units shall be electrically held or electrically operated mechanically held, as indicated on drawings, and shall be recommended by manufacturer for type of load served.
- D. Contacts shall double-break type of same ampere rating as line side circuit wiring.
- E. Contacts shall be field-convertible to normally open or normally closed.
- F. Contactor coils shall be encapsulated. Electrically held contactors shall have continuously rated coils. Mechanically held contactors shall be equipped with coil-clearing contacts to energize coils only when switching.
- G. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors.
- H. Units shall be equal to GE CR460 series in NEMA 1 or NEMA 3R enclosure as indicated.

2.44. FIRE ALARM SYSTEM (ADDRESSABLE):

- A. General: The contractor shall furnish and install a complete power limited automatic and manual fire alarm system, as specified herein and indicated on the drawings. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

devices, provisions for connection of remote monitoring, a wiring system, and all necessary devices required to provide a complete operating system. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 and meet all requirements of the local authorities having jurisdiction. The Underwriter's Laboratories, Incorporated, or approved by the Factory Mutual Laboratories shall list all equipment and devices. The equipment shall be EST, FCI or Notifier. No deviation will be considered unless submittals are received and approved in writing, not less than ten days prior to bid date.

- B. Fire Alarm Document Box: The contractor shall furnish and install a fire alarm document enclosure as mandated by NFPA 72 Chapter 7.7.2.1. The system records documents box shall be constructed of 18 gauge cold rolled steel. It shall have a red powder coat epoxy finish. The cover shall be permanently screened with 1" high lettering and read "FIRE ALARM DOCUMENTS" with white indelible ink. The access door shall be locked with a ¾" barrel lock which is keyed the same as the manufacturer's fire alarm panel. The enclosure shall supply 4 mounting holes to securely fasten to the wall. Inside the enclosure will accommodate standard 8.5" x 11" manuals and loose document records that may be placed in a three-ring binder. All documents & software will be protected within the enclosure. A legend sheet will be permanently attached to the door for system required documentation, key contacts, and system information. The fire alarm document will have securely mounted inside the enclosure a minimum of 4 Gigabyte digital flash memory drive with a standard USB type B connector for uploading and downloading electronic information. The drive shall not be accessible without tools to any person who gains access to the enclosure. The enclosure shall also provide 2 Key ring holders with a location to mount standard business type cards for key contact personnel. The password to the fire alarm programming shall be provided to the owner in the fire alarm document box. The password must be provided, fire alarm contractors that refuse to give password will not be accepted. Contractor will be responsible for replacing the entire fire alarm system at their cost and cost of delaying the project if password is not provided.
- C. Control Panel: The control panel shall be an addressable type panel capable of handling up to 256 devices, with 60-hour minimum standby battery. The panel shall provide for the connection of alarm circuits as indicated and shall include the following features.
1. The fire alarm panel shall detect the operation of any initiating device, indicate by annunciator lamps the area of the alarm condition, and operate all alarm auxiliary devices.
 2. A pilot light shall normally be on, indicating that the system is receiving power from the building service supply. A failure of the building service supply shall cause the lights to go out.
 3. A trouble light and trouble buzzer, operating together, shall signal any trouble condition. Failure of the building service supply, disarrangement in the system wiring, or alarm condition shall cause that trouble light to come on and the trouble buzzer to sound. A self restoring silencing switch shall be provided to silence the trouble buzzer, which shall be arranged so the trouble light will remain on until the system is restored to normal.
 4. All notification signals shall be automatically locked in at the control panel until the operating device is returned to its normal condition, and the panel is manually reset. A switch shall be provided on the control panel for silencing the notification devices. The manual reset switch and the alarm-silencing switch shall be of the self-restoring type, which cannot be left in the abnormal position.
 5. The control panel shall provide relay contacts, of quantity as shown on the drawings, for control of heating, ventilation and air conditioning equipment. Such contacts shall be connected to air conditioning equipment, as indicated on drawings, for shutdown of individual units. Unit shutdown shall be initiated by duct-mounted smoke detectors unless otherwise indicated. Operation of any initiating device shall open all control contacts and release all mechanically held doors.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

6. The control panel shall be equipped with a front mounted Drill switch.
 7. Metal oxide varistors (MOV's) shall be provided on the system power supply and the municipal connection circuit to provide transient suppression protection to the control panel.
 8. Power Supply: The power supply shall be 24 Volt DC, filtered and regulated, and shall provide sufficient power for all system functions. The fire alarm system main power supply shall operate at 120 Volt AC obtained from the building service. The 120-volt AC main power shall be converted to low voltage direct current for system operation. The system shall operate on 24 volts DC with trickle charged batteries provided as an emergency source of supply for operating the system in the event of interruption of main power. A changeover relay in the control panel shall transfer to standby power automatically upon main power failure and automatically reconnect to main power upon restoration.
- D. Manual Stations: Manual Fire alarm stations shall be an addressable double acting, semi-flush mounted type. Stations with two sets of contacts will not be acceptable.
 - E. Smoke Detectors: Smoke detectors shall be addressable photoelectric type with base.
 - F. Heat Detectors: Addressable 135 degree/rate of rise type with base.
 - G. Duct Mounted Smoke Detectors: Duct detectors shall be addressable photoelectric type with sampling tube.
 - H. Contractor shall be responsible for coordinating prior to bid with mechanical drawings to confirm all duct mounted smoke detector locations and quantities. Contractor shall include in their base bid price the cost of all additional duct mounted smoke detectors and circuitry needed for locations.
 - I. Duct Detector Remote Test Station: Test stations shall be keyed with indicator light.
 - J. Audible/Visual Notification Devices: Audible/visual notification devices shall be four wire, horn/strobe units capable of 90 dB audible output, 100 candela-second output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.
 - K. Visual Notification Devices: Visual notification devices shall be strobe units capable of 100 candela-second visual output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.
 - L. Voice Control Panel: The Voice Control Panel shall play a digitally recorded message or microphone input for evacuation instructions. The unit shall be installed next to the FACP, shall be equipped with emergency battery power, and shall provide a minimum of 75 watts of amplification.
 - M. Remote Microphone Panel: Remote Microphone Panels shall have a keyswitch control and shall be supervised.
 - N. Remote Amplifier: Remote amplifiers shall be 120 watt with battery backup.
 - O. Speaker/Visual Notification Devices: Speaker/Visual Notification devices shall be semi-flush, wall mounted, combination strobe/speaker assemblies with a minimum strobe output of 100 candela-second equal to Notifier #E70-24110W-FR for wall installation or Notifier #E70-W for speaker only ceiling installations.
 - P. Interface Relay:
 1. Provide addressable control modules equal to Notifier #CMX-2 or interface relays equal to Notifier #MR-101/CR as required for interface of the Fire Alarm System with HVAC shut down, door holders, kitchen hood fire suppression system, and fan shut down, and any other locations required for proper interface and operation of systems.
 2. A control module or interface relay shall be provided for each duct mounted smoke detector and shall be the point of interface between the Fire Alarm System and the HVAC Control System.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

3. Contacts shall be rated for 10 A at 120 V.
- Q. **UL Fire Listed Cellular Communicator: Terminals and other necessary facilities shall be provided in the control panel to permit automatic transmission of trouble and alarm signals over a UL listed cellular communicator to the fire, police, or other continuously manned facility, so designated for response to fire emergency. Provide 3-years of cellular and monitoring for the fire alarm system in the base bid from the date of substantial completion.**
- R. Annunciator Panel: Provide and install an annunciator that provides an audible and visual indication of an alarm or trouble condition for each zone, an alarm silence switch, and a key operated test and reset switch.
- S. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extenders (NAC Panels):
1. Provide auxiliary power supplies and/or NAC Panels where required for notification devices, door holders, annunciators, or for other devices requiring supplemental power.
 2. Remote power supplies shall include a filtered and regulated 24 VDC output, provisions for automatic transfer to battery back-up in case of primary power failure, and batteries sized for 60 hours of operation.
- T. All devices installed on the exterior shall be weatherproof.
- U. **Monitoring - Provide 2-years of monitoring for the fire alarm system in the base bid from the date of substantial completion.**

2.45. CONCRETE:

- A. Concrete for electrical requirements shall be:
1. Composed of fine aggregate (sand), coarse aggregate (graded from three-sixteenth (3/16) inch to one (1) inch), Portland cement, and water proportioned and mixed so as to produce a plastic, workable mixture.
 2. Aggregates shall be free from detrimental amounts of dirt, vegetable matter, soft fragments, or other foreign substances.
 3. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities.
 4. Concrete shall have a minimum 3000 psi ultimate twenty-eight day compressive strength and a maximum three (3) inch slump.

PART 3 - EXECUTION

3.01. GENERAL:

- A. This section includes the installation of the complete electrical system.

3.02. ELECTRICAL SERVICE:

- A. General: Arrange with local electric Utility Company for service to be brought to the building, and for installation of meter. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations.
- B. Service requirements: It is the responsibility of this Section, prior to bid, to reaffirm with the Utility Companies involved, that locations, arrangement, Power Company voltage, phase, metering required, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.
- C. Notify Architect of any changes required before proceeding with work.
- D. Fees and deposits:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

1. The Electrical Contractor shall be responsible for verification and payment of all utility fees associated with installation of the electrical service.
 2. The Owner shall pay the cost of establishing an electrical service account and permanent meter deposit.
- E. Metering: Obtain metering equipment from Utility Company and install in compliance with the Utility Company's requirements. The Electrical Contractor shall provide and install all necessary metering raceways, fittings, supports, connectors and ground conductor necessary for a complete installation. Provide 100# pull wire in all metering conduits.
- F. Main Service Equipment: Provide UL approved service entrance components as indicated on drawings or specified herein.
- G. Provide a full-size copy of the AS-BUILT Power Riser Diagram framed behind plexiglass screwed to the wall near service entrance in main electrical room.
- H. Service lateral or feeder: Extend lateral or feeder of the size shown on drawings from service equipment to the point of service as indicated (verify exact location with Utility Company).
1. For Overhead Service, provide and install service entrance fitting on conduit and leave sufficient slack conductor for connection to utility feeder 10' above finish grade, 12' above drive and 18' above street.
 2. For Underground Service, provide and install underground conduit to utility riser, as directed by Utility Company. Conduit shall be of size and quantity as indicated on drawings. Provide 480# polypropylene pull line in each empty conduit.
 3. For Underground Service, provide and install transformer pad, primary underground conduit to utility riser as directed by Utility Company, underground secondary conduit, and secondary conductors. Conduit shall be of size and quantity as indicated on drawings. Provide spare 4" conduit in transformer pad extending 2' beyond edge of pad with PVC cap. Provide 480# polypropylene pull line in each empty conduit.
 4. On service transformers with multiple taps, it shall be the responsibility of this section to coordinate tap selection with the electric utility to insure the proper nominal voltage.

3.03. COMMUNICATION SERVICE:

- A. General: Arrange with local Communications Utility Company for service to be brought to the building. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations.
- B. Service requirements: It is the responsibility of this Section, prior to bid, to reaffirm with the Utility Companies involved, that locations, arrangement, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.
- C. Fees and deposits:
1. The owner shall pay all utility fees and deposits associated with service installation.
 2. The Contractor shall pay all costs associated with the installation of the service.
- D. Telephone Backboards: Provide backboards as indicated on drawings. Backboards shall consist of a 4' x 8' x 3/4" sheet of plywood mounted to the wall and painted with two coats of ANSI 61 gray enamel on both sides and all edges. Each telephone backboard shall be provided with a #6 copper ground wire connecting it to the ground electrode system.
- E. Telephone Termination Cabinet (for outdoor service point): Install a 30"x 36"x 5" (minimum) NEMA 3R Telephone Termination Cabinet with hinged cover, integral covered splice compartment, and 3/4" plywood back board equal to a Benner-Nawman #BN-30365 where indicated on the plans. Terminate the service conduit in the covered splice compartment and conduit from each tenant space in the telephone equipment compartment.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- F. Phone Service Raceway: Extend conduit of the size shown on drawings or as directed by the telephone company from the telephone backboard to the point of service as indicated or as directed by the telephone company (verify exact location with Utility Company).
1. For overhead telephone service, provide and install conduit with weatherhead as shown on drawing. Weatherhead shall be mounted (with extended mast if necessary) such that overhead service wiring shall be 10' above finish grade, 12' above drive and 18' above street. Provide 480# polypropylene pull line in each empty conduit.
 2. For underground telephone service, provide and install a minimum 2" underground conduit from the TBB to the utility pedestal or riser, as directed by Utility Company. Provide 480# polypropylene pull line in each empty conduit.

3.04. GROUNDING:

- A. Bond the neutral conductor and various conductive materials in the building per NEC Article 250.
- B. Grounding Electrode System: A bare copper grounding conductor shall be bonded to grounding electrodes as specified below. This conductor shall serve as ground for system neutral and for building equipment bonding. Where conductor is #6, or smaller, or is subject to injury, it shall be run in conduit, Schedule 80 PVC or Rigid Galvanized to which the conductor shall be bonded at both ends.
1. Grounding electrodes shall be as follows:
 - a. Cold water piping, if metal and in direct contact with the earth for 10 feet or more, at the point of entry into the building. Attach ground conductor to cold water piping with UL approved bronze clamp.
 - b. Building structural steel, if present and accessible.
 - c. Grounding electrode shall be attached with exothermic weld connection or irreversible crimp type connector similar to Burndy YGHR connectors. Crimps must be made with Burndy tool approved by the manufacturer for setting irreversible crimp connections.
 - d. Foundation reinforcing bar system. Coordinate with General Contractor to provide turned up re-bar (sleeved) near service point for attachment of grounding electrode above grade. Grounding electrode shall be attached with UL approved exothermic weld connector.
 - e. Driven ground rod(s).
 - 1) Three 3/4" x 10' copper weld rods shall be driven into the ground at the lowest point adjacent to the building, spaced a minimum of 10' apart.
 - 2) Ground rods shall be driven to 12" below grade.
 - f. Grounding electrode shall be attached with exothermic weld connection or irreversible crimp type connector similar to Burndy YGHR connectors. Crimps must be made with Burndy tool approved by the manufacturer for setting irreversible crimp connections.
 - g. Existing grounding electrode system. If an existing electrical service is in place, it must be bonded to the new grounding electrode system.
- C. Connections to grounding rods, building structure, counterpoise, and conductor junctions shall be made by exothermic weld unless specifically noted otherwise.
- D. Electric system (neutral) ground: The current carrying neutral leg of the wiring system shall be of insulated conductor and shall be connected to the grounding electrode conductor only via the neutral connection at the service equipment. Each branch circuit or multi-outlet branch circuit shall be provided with a dedicated neutral conductor.
- E. Equipment grounding conductors:
1. An equipment grounding conductor (copper with green insulation except where bare copper is used) shall be provided in all wiring raceways.
 2. Sizes shall be in accordance with NEC 250.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

3. The equipment grounding conductor shall originate in the same panelboard, panelboard section, as the circuit conductors.
 4. The equipment grounding conductor bonding the sections of multi-section panelboards shall be sized per NEC 250.
 5. The equipment grounding conductor is not included in number of branch circuit conductors indicated on the drawings.
- F. Telephone service ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the TBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.
 - G. Computer backboard ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the CBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.
 - H. Metal Lighting poles: Provide a grounding electrode at poles supporting outdoor lighting fixtures in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
 - I. Grounding electrode resistance shall be less than 15 ohms. The resistance of the grounding electrode shall be tested by the Fall of Potential Method.
 - J. Lighting Standards (Poles): Install 10' driven ground rod at each pole. On non-metallic poles, ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.
 - K. Each grounding conductors at the service entrance ground bus bar shall be provided with a brass round identifying tag. Tag shall indicate where ground wire is terminated.

3.05. EXCAVATION, CUTTING AND BACKFILLING:

- A. Provide cutting and patching, under the supervision of the General Contractor, as required for the work in Section 16.
- B. Locate all existing below grade and/or below floor utilities prior to beginning any site excavation or cutting of existing floor slabs. The Contractor shall repair any damage to existing utilities or systems.
- C. Saw cut existing concrete slabs and asphalt paving.
- D. Trenching:
 1. Dig trenches true to line, with a flat, even bottom.
 2. Width of the trench shall provide not less than 3 inches clearance from the conduit to each side of the trench.
 3. Ensure that foundation walls and footings and adjacent load bearing soils are not disturbed in any way.
 4. Conduits shall be installed below footings where possible. Where a line passes under a footing, make crossing with the smallest possible trench to accommodate the conduits/sleeves.
 5. Where a line must pass adjacent to and below the bottom of a column footing, or the corner of a continuous footing, backfill the trench with concrete up to the level of the footing bottom, for a distance away from the footing equal to the depth of the fill.
 6. Keep excavation free from water, by pumping if necessary.
 7. Where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level to proper elevation with sand or earth free from particles that would be retained on a ¼-inch sieve.
 8. Remove and relocate existing obstructions as directed.
 9. The Contractor shall be responsible for the repair and/or replacement of any damage to existing utilities, structure, or finishes.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

10. Coordinate work with other trades as work progresses so cutting and patching will be minimal.
 11. Refer to Section "Earthwork" for shoring, sub-soil assumptions and data, work around trees, surplus earth, etc.
- E. See Section 16100, "Conduit Installation, Below grade and below slab conduit installation", for installation of conduits in trenches.
- F. Backfilling:
1. Immediately after inspection, cover conduits with 3" of compacted sand or earth free from particles that would be retained on a 1/4inch sieve. Do not to disturb the alignment or joints of the conduits.
 2. Carefully backfill with 4" of earth free from clods, brick, etc., firmly puddling and tamping.
 3. Thereafter, puddle and tamp every vertical 4" for hand tamping or 8" for heavy duty mechanical tamping.
 4. Backfill shall meet the compaction requirements set forth in Division 2.
 5. Backfilling Beneath Slabs and Pavement: Trenches beneath future slabs or pavement, including but not limited to buildings, drives, parking areas, sidewalks, playground surfaces, and equipment pads, shall be backfilled, from 3" above top of conduits to final grade, with crushed aggregate, AHD 825, type B, compacted in 4" layers to 100% ASTM 698.
 6. Install marking tape above conduits at 12 inches below grade.

3.06. SLEEVES, INSERTS, AND SUPPORTS:

- A. Provide and install No. 16 gauge galvanized steel or iron sleeves in all walls, floors, ceilings, and partitions. Sleeves shall have no more than 1/2" clearance around pipes and insulation.
- B. The contractor shall furnish to other responsible trades all sleeves, inserts, anchors and other required items which are to be built in by other trades for securing of all hangers or other supports by the Contractor.
- C. The contractor shall assume all responsibility for the placing and sizing of all sleeves, inserts, etc., and shall either directly supervise or give explicit instructions to other trades for their installation.
- D. The contractor shall seal all conduits through floors, smoke partitions, and floor partitions, with a sealant approved for the application.
- E. All sleeves through sound barrier walls and partitions shall be sealed with mineral wool.
- F. Through the floor conduit penetrations shall be sealed watertight.
- G. Furnish and install steel angles and channels as required for mounting and bracing heavy equipment and conduits. Steel shall be securely bolted or welded to structure and equipment bolted to the steel framework. Obtain the approval of the Architect prior to welding.

3.07. BELOW GRADE THRU WALL WATER SEALS:

- A. Each conduit penetrating exterior, below grade, cast concrete walls shall have the annular space around the conduit sealed with an approved Thru Wall Water Seal System.
- B. Where the system includes water seal thru wall sleeves, the Electrical shall provide properly sized sleeves to the contractor responsible for constructing the walls and shall be responsible for the proper location of each sleeve.
- C. Where openings are to be core drilled, the Electrical Contractor shall be responsible for the core drilling and for coordinating proper sizing and location of each opening.

3.08. FIRE STOPPING:

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- A. The Electrical Contractor shall be responsible for firestopping of all penetrations of fire rated partitions made by any and all lighting, power, and auxiliary circuiting, sleeves and/or equipment.
- B. The Electrical Contractor shall submit manufacturers' UL System drawings for the systems to be utilized. The systems shall be compatible with the partition ratings as indicated on the Architectural drawings and in accordance with details on the Electrical drawings.
- C. Penetrations of fire rated partitions shall be sealed with an approved fire sealant resulting in the completed penetration having the same fire rating as the partition.
- D. The installation shall be in accordance with the manufacturer's UL system detail and installation instructions to attain the required fire partition rating.
- E. Empty sleeves through 1 and 2 hour rated partitions shall be plugged with mineral wool.
- F. Sleeves through 4 hour rated partitions shall be plugged with mineral wool and fire stopping material.

3.09. ROOF PENETRATIONS:

- A. Furnish roof flashing for all equipment, installed under Section 16, which penetrates through the roof. Flashing shall be approved by the Architect prior to installation.

3.10. CONDUIT INSTALLATION:

- A. Conduits shall be as follows:
 - 1. Overhead Service Entrance - Rigid Galvanized Steel (RGS) Conduit or IMC.
 - 2. Underground Service Laterals: Schedule 40 rigid PVC in horizontal runs with rigid galvanized steel elbows turning up to vertical RGS.
 - 3. Where subject to moisture or mechanical injury - RGS conduit.
 - 4. ALL conduits exposed to moisture or subject to mechanical damage shall be RGS. Where conduit exits building, the changeover from EMT to rigid shall be inside exterior wall.
 - 5. In open shop and industrial installations RGS shall be run to 10' A.F.F.
 - 6. All conduit exposed on the outside of the building envelope shall be Rigid Galvanized Steel (RGS) conduit. This includes all conduits on and/or under canopies or awnings.
 - 7. In concrete or solid masonry – RGS conduit
 - 8. Above furred spaces or in cells of hollow masonry - EMT
 - 9. Concealed inside drywall construction walls and above lay-in ceilings – EMT.
 - 10. Exposed conduits:
 - a. Conduits installed exposed in shop, warehouse, and manufacturing areas shall be RGS up to 12' A.F.F. Conduits in such spaces above 12' A.F.F. may be EMT unless indicated otherwise on the drawings.
 - b. Exposed indoors in non-hazardous unfinished areas not subject to physical damage - EMT
 - c. Exposed in kitchen and dishwashing areas: Rigid aluminum.
 - 11. Branch circuits in slab (3/4" and larger) - PVC. Turn up through slab with RGS ells - no exceptions. Extend rigid turn-ups 2" minimum above finish floor level.
 - 12. Circuits beneath building vapor barrier - PVC. Turn up through slab with RGS ells - no exceptions. All elbows 45° and greater shall be RGS. Extend RGS turn-ups 2" minimum above finish floor level.
 - 13. Below Grade – PVC with RGS, or rigid aluminum where applicable, elbows turning up to vertical. All below grade elbows 45° and greater shall be RGS.
 - 14. Motor, HVAC equipment, and vibrating equipment connections - flexible metal conduit, liquid tight flexible metal conduit outdoors, in kitchen and dishwashing area, or in other wet areas. Liquidtight flexible nonmetallic conduit shall be used only where specifically indicated.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

15. IMC may be used where RGS is indicated.

B. Conduit sizes:

1. Unless specifically indicated otherwise herein or on the drawings, the minimum conduit size shall be 3/4".
 - a. All conduits installed below grade or below slab shall be 3/4" minimum.
 - b. The minimum size for flexible lighting fixture "whips" shall be 3/8" and the maximum length shall be 6 feet. Lighting fixture "whips" shall be defined as flexible conduits with conductors feeding one or more recessed lighting fixtures installed in suspended, lay-in, acoustical ceiling systems from a single junction box.
 - c. 1/2" conduit may be for final connections to equipment or fixtures where conduit is less than three (3) feet in length and is extended from a junction box or from a 3/4" conduit stub up.
2. Conduits shall be sized in accordance with the National Electrical Code as adopted by the local authority having jurisdiction or as amended to date, except where a larger size is indicated on the drawings or specified herein.

C. Layout:

1. Generally, follow the conduit layout shown on the drawings. However, the layout is diagrammatic only and must be adjusted for structural conditions, built-in equipment and other factors. Offsets are not indicated and must be furnished as required.
2. Install all conduits concealed except in equipment rooms and where exposed runs are specifically indicated.
3. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.
4. Eliminate trapped runs insofar as possible.
5. Do not chase new work, but instead build in conduit as work progresses.
6. Do not run conduit in cavity of exterior walls.
7. Run concealed conduits in direct line with long sweep bends and offsets where practicable.
8. Install exposed conduit with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends.
9. Where conduits are indicated exposed overhead, runs down to wall outlets shall be concealed in wall.

D. Conduit Installation:

1. Securely fasten conduits to all sheet metal outlets, cabinets, junction and pull boxes with locknuts and bushings, taking care to see that stout mechanical and solid electrical connections are obtained.
2. All conduits shall have bushings with smooth beveled throats installed at both ends prior to installing conductors. Split bushings around conductors shall be taken to indicate that the conductors were pulled into conduit without the proper bushings installed and a basis for requiring the replacing of the conductors.
3. Conduits entering service enclosures (panelboards, disconnect switches, switchboards, motor control centers, etc. used as service entrance equipment) shall be provided with specification grade, insulating, grounding type bushings. Grounding bushing shall be bonded together and bonded to the service grounding buss.
4. Support:
 - a. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- b. Support shall be provided at appropriate intervals not exceeding eight (8) feet with straps, hangers, and brackets specifically designed for the application.
 - c. Channels shall be 1 inch for 18-inch wide trapeze, 1-3/8 inch for 24 to 30 inch, and 1-5/8 inch for over 30-inch wide trapeze.
 - d. Perforated steel straphangers, "butterfly clips", or tie-wire supports are not acceptable.
 - e. Conduits shall not be supported from ceiling support wires.
 - f. Conduit shall not be supported from mechanical system ducts or piping.
 - g. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used.
 - h. PVC conduits shall be supported per the NEC with PVC or stainless clamps and stainless-steel hardware.
 - h. Attach to supporting devices with screws, bolts, expansion sleeves or other workmanlike means appropriate to the surface.
 - i. In stud walls, anchors shall be completely rattle proof.
 - j. For conduits in damp and wet locations, use stainless steel clamps and stand-offs, or galvanized malleable or cast-iron clamps and spacers.
 - k. All mounting hardware for aluminum conduit shall be stainless steel.
 - l. Surface mounted conduits installed in kitchen and dishwashing areas shall be supported off walls approximately 3/16".
5. Thread rigid conduits so that the ends meet in couplings; cut ends square, ream smooth and draw up tight.
 6. All field cut threads shall be cleaned with a solvent such as mineral spirits and painted with two coats of galvanize primer.
 7. Cap conduit ends to keep out water and trash during construction.
 8. Field made bends:
 - a. Avoid field-made bends where possible, but where necessary, use a proper hickey or conduit-bending machine.
 - b. Field made bends in PVC conduit shall be made with a heated PVC conduit bender.
 - c. Make no bends with radius less than six times the conduit diameter, nor more than 90 degrees.
 9. Make changes in direction with pull boxes, symmetrical bends and/or cast-metal fittings.
 10. Total bends in any conduit run shall not exceed the equivalent of four, quarter (90°) bends for a total of 360°, per NEC, between pull boxes.
 11. Replace any crushed or deformed conduits.
 12. Conduits passing through roofs shall be in place before roof is installed.
 13. Conduits installed in concrete/grout filled CMU walls shall be Rigid steel or IMC conduits installed field wrapped with 0.010 inch-thick pipe-wrapping plastic tape applied with a 50 percent overlay. Painted on coating shall not be acceptable.
 14. Where conduits pass through or across building expansion joints, provide hot-dipped galvanized expansion fittings with bonding jumpers.
 15. Ensure that all penetrations of firewalls are sealed per NEC and IBCC.
 16. Right and left couplings shall not be used; conduit couplings of the Erikson type shall be used at location requiring such joints.
 17. Paint all conduits exposed in finished spaces. Paint shall consist of one coat of zinc rich primer plus two top-coats of water-based latex paint, color to match adjacent finishes. Verify colors and paint system with Architect.
 18. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.
 19. All conduits passing through walls of coolers or freezers shall have seal fitting installed on the outside of the cooler/freezer wall and within 3" of the wall. Fitting shall be sealed per manufacturer's recommendations.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

20. All conduits exposed to water shall have flexible conduits with a drip curve in conduit to keep from allowing water run into enclosure and provide a Myers hub connector to the enclosure.
 21. Install telephone, data, intercom, and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- E. Below grade and below slab conduit installation:
1. See Section 16100, "Excavation, Cutting, and Backfilling" for trenching and backfilling requirements.
 2. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable. Wrap shall extend a minimum of 1" above slabs or 3" above finished grade where there is no slab. Alternate methods must be approved by Engineer prior to bids.
 3. Top of the conduit shall be not less than 30 inches below grade.
 4. Run conduit in straight lines except where a change of direction is necessary.
 5. Conduits stubbed up from below grade or slab into exterior walls shall be turned toward the interior of the building below slab fill perpendicular to the wall. Conduits shall not be turned out toward the exterior unless specifically indicated to do so.
 6. Placing of conduits below slab on grade:
 - a. Conduits 1-1/4" and larger shall be installed a minimum of 12" below the bottom of slab in the clay/sand fill below any gravel fill material.
 - b. Conduits 1" and smaller may be installed in the porous/gravel fill below the vapor barrier.
 7. Multiple Conduits:
 - a. Separate multiple conduits by a minimum distance of 2-1/2 inches horizontally and 3 inches vertically, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 3 inches horizontally and vertically.
 - b. Where multiple layers of conduits are to be placed in a trench, each layer shall be placed in the trench, straight and parallel, clear fill material (see Excavation, Cutting, and Backfilling) placed and tamped in place to provide the specified spacing, and each subsequent layer placed in the same manner.
 - c. Stagger the joints of the conduits by rows and layers to strengthen the conduit assembly.
 - d. Conduits shall not be placed haphazardly in the trench.
 8. Where conduits pass through footings or foundation walls:
 - a. Conduits roughed in beneath slab shall exit the foundation perpendicular to the building spaced approximately 3" apart. Conduits shall be arranged in a single horizontal row where practical.
 - b. Secure approval from the Architect and Structural Engineer prior to penetrating any footing or foundation wall.
 - c. Schedule 40 PVC sleeves shall be cast in the footings or foundation wall for the conduits to pass through.
 - d. Multiple sleeves shall have 3" clearance, vertically and horizontally, between the sleeves unless directed otherwise by the Architect and/or Structural Engineer.
 9. Where PVC conduit is installed below grade a PVC to rigid metallic conduit coupling shall be installed in the horizontal run and a rigid galvanized steel conduit elbow installed to turn

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- up to above grade. Where above grade conduits are indicated to be rigid aluminum the elbow turning up to vertical shall be rigid aluminum.
10. Rigid aluminum conduit shall be wrapped same as RGS through concrete from 2" each side of the concrete.
 11. Rigid galvanized conduit shall extend a minimum of 6" above the finished floor level.
 12. In hazardous areas the coupling shall be below grade and a single section of conduit installed up to 18" A.F.F. to accept the required seal fitting.
 13. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used from 6 inches above the floor to the served equipment.
 14. Conduits shall exit concrete slabs vertically.
 - a. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.
 - b. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
 15. Empty or spare conduit stub-ups shall be capped with a threaded cap.
 16. Encasement Under Roads, Structures, and at other locations indicated on the drawings:
 - a. Under roads, paved areas, railroad tracks, and other locations indicated on the plans install conduits in concrete encasement of rectangular cross-section providing a minimum of 3-inch concrete cover around ducts.
 - c. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assemblies shall consist of base spacers, intermediate spacers, and top spacers to provide a completely enclosed and locked-in conduit assembly.
 - d. Install #4 rebar at each corner of the encasement and at not more than 18" on center vertically and horizontally on the sides of the encasement. #4 rebar hoops shall be installed at not more than 18" on center along the length of the encasement.
 - e. Concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond the rails on each side of railroad tracks.
 17. Conduits to be installed under existing paved areas, which are not to be disturbed, and under roads and railroad tracks, shall be installed through a zinc coated, rigid steel, sleeve, jacked into place.
 18. Conduits installed between handholes, manholes or other accessible areas shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward manholes and other necessary drainage points.
 19. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater so as to minimize pulling tensions on cables to be installed in conduits. In no case shall pull or junction boxes be further than 300 feet apart. Provide pulling tension calculations on all underground runs over 200 feet as required in Paragraph 1.09 Submittals.
- F. Conduit Installation in concrete slabs:
1. Conduit installed in concrete slabs shall be rigid steel or IMC. Rigid steel or IMC conduits installed in slabs-on-grade shall be field wrapped with 0.010 inch-thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable.
 2. At slabs on grade, conduit, 3/4" maximum, may be run in the slab; larger conduit shall be run below slab.
 3. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

4. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
- G. Flexible conduit:
1. At motor or equipment connections:
 - a. The maximum length allowable for flexible conduit shall be 36 inches except at lighting fixtures.
 - b. Flexible conduit installed outdoors shall be installed so as to provide an 8 inch minimum drip loop as measured from the lowest end of the conduit.
 2. At lighting fixture connections provide flexible steel conduit by one of the manufacturers named for rigid.
 - a. Maximum length allowable shall be 72 inches.
 - b. Support flexible conduit such that it does not contact the ceiling system, ductwork, or other equipment above the ceiling. The conduit shall not be attached to a ceiling or ceiling support system.
 - c. All fixture whips shall be supported within 12" of outlet/junction boxes with single hole clamps.
- H. Empty conduit:
1. Install a #14 galvanized fish wire or polypropylene pull cord with 14-inch free ends in all empty power and/or auxiliary conduits.
 2. All conduits indicated to be terminated above the ceiling shall have an elbow turned out above the ceiling and shall be terminated with an insulating bushing.
 3. Empty conduits stubbed out of buildings below grade:
 - a. Empty conduits stubbed out of buildings below grade shall extend 5 feet outside of the building foundation.
 - b. Install a 12"x 12"x 6" concrete marker at grade, above the end of the conduits, with "ELEC" inscribed on top.
 - f. Note on as-built drawings the exact location where empty conduit(s) are stubbed out below grade to the building exterior. Indicate conduit sizes and number of each size.
 - g. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater. In no case shall pull or junction boxes be further than 200 feet apart.
- I. Conduit entries into enclosures, panelboards, and wiring troughs:
1. Layout conduit entries carefully to allow clearances for the number and sizes of conduits, electrical equipment, and future expansion.
 2. In sheet metal equipment use Greenlee Knock-Out punch, or equal, to cut holes for conduit installation. Do not drill holes or cut holes out with snips or torch.
 3. In cast enclosures and boxes drill conduit openings with correct size drill for tight fit.
- J. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain.**

3.11. CONDUIT BODIES:

- A. Conduit bodies shall be sized in accordance with NEC 370, and 373.
1. Conduit bodies for conductor sizes AWG #4 and larger shall be mogul type bodies sized in accordance with NEC 370-28.
 2. Conduit bodies for conductor sizes AWG #6 and smaller shall be sized in accordance with NEC 370-16(c).

3.12. JUNCTION AND PULL BOXES:

- A. Junction and pull boxes shall be sized per NEC to accommodate the installed number and size of conductors and conduits.
- B. Boxes shall be securely fastened in place.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- C. Boxes serving lighting fixtures installed in accessible, suspended ceilings:
 - 1. Provide number of boxes as required to maintain fixture whips within the 6' maximum length.
 - 2. Generally, attach to underside of structure above, in accessible location, to accommodate a maximum 6' flexible conduit connection to each fixture or fixture run.
 - 3. Where the structure above is more than 18" above the ceiling the boxes shall be supported within 18 inches of the ceiling with all thread rod and/or strut.
- D. Install galvanized steel utility box plates, by box manufacturer, at exposed conduit fittings or boxes.
- E. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain.**

3.13. WIRE AND CABLE INSTALLATION:

- A. No conductor shall be smaller than #12 except where so designated on the drawings or specified elsewhere.
- B. Multiwire lighting branch circuits shall be used where indicated.
- C. Wiring devices shall be connected such that each device can be removed without interrupting the neutral or equipment grounding conductors serving other outlets on the same circuit(s).
- D. Joints and splices in wire shall be made with solderless connectors and covered so that insulation is equal to conductor insulation. Wire nuts shall not be used for conductor #8 and larger.
- E. No splices shall be pulled into conduit.
- F. Both conductors and conduit shall be continuous from outlet to outlet.
- G. No conductor shall be pulled into the conduit until the conduit is cleaned of all foreign matter.
- H. When installing parallel conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, and type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded together at both ends in an approved manner.
- I. MC cable or Romex cable will not be accepted unless specifically called for on drawings.
- J. Wiring thru light fixtures and receptacles will not be accepted.

3.14. AUXILIARY GUTTERS (WIRING TROUGHS):

- A. Auxiliary Gutters shall be sized per NEC to accommodate the installed number, size, and orientation of conductors and conduits.
- B. Conductors serving a gutter shall be extended without reduction in size, for the entire length of the gutter.
- C. All taps and splices shall be made with insulated multi-tap connectors.

3.15. CIRCUITS AND BRANCH CIRCUITS:

- A. Outlets shall be connected to branch circuits as indicated on the drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.16. WIRE JOINTS:

- A. Except for motor circuits, wire joints for #8 and smaller wire shall be made with twist on connectors.
- B. Wire joints and splices for motor circuits, for conductors #6 and larger, and for smaller conductors where other connectors are not rated for the number of conductors involved shall

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

be made with split bolt connectors rated for the applicable conductor size, number of conductors, and conductor material.

1. Properly tape and insulate all joints to attain the same insulation rating as the cable insulation.
 2. Splices for #6 through #1 shall have a minimum of two (2) layers of rubber tape covered by a minimum of three (3) layers of electrical tape.
 3. Splices for #1/0 and larger conductors shall have a minimum of two (2) layers of electrical filler tape covered by a minimum of three (3) layers of electrical tape.
- C. Splices in control conductors shall be avoided as much as possible. Stranded control conductor up to #12 may be connected or spliced with hand crimped type compression connectors. The connectors shall be of the proper size for the conductors being connected.
- D. Splices and joints made with mechanical/hydraulic type compression connectors:
1. Connections and splices shall be made with connectors rated for the applicable conductor size and conductor material.
 2. Dies used shall leave the die number embossed in the connector. The Contractor shall provide the Engineer with the Manufacturer's connector and die chart prior to final inspection.
- E. Taps and splices in auxiliary gutters/troughs shall be made with insulated multi-tap connectors.
- F. Wire joints and splices made below grade shall be made with UL listed waterproof connectors, wire nuts, or splice kits.
- G. All joints and splices shall be made in junction boxes, wiring troughs, or conduit bodies sized per NEC.
- H. All connections to switchboards, panelboards, transformers, generators, ATS, or any other type electrical distribution type equipment shall be compression type fittings. Mechanical fittings will not be accepted in these applications.

3.17. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:

- A. Strut Systems: Strut shall be utilized to rack exposed piping vertically or horizontally on walls and across slabs (where applicable). Strut may be utilized to support piping above ceilings, for support of equipment, and elsewhere as deemed appropriate.
1. Strut in conditioned spaces and above accessible ceilings shall be electro-galvanized.
 2. Strut installed outdoors, in mechanical rooms, and in other unconditioned spaces shall be hot-dipped galvanized.
 3. Strut installed in waste-water treatment facilities, kitchens, dishwashing spaces, and labs shall be stainless steel.
 4. Strut fittings and hardware, including anchors, shall be same material as strut.
 5. Saw cut strut square, 6" minimum lengths. Strut on continuous runs of pipe shall be same length. File or grind burrs from saw cuts.
 6. After installation, electro-galvanized and hot-dipped galvanized strut shall be painted with two coats of zinc primer.

3.18. OUTLET BOX INSTALLATION:

- A. General: The drawings indicate approximate locations only; determine the exact location at the building in view of all structural and architectural conditions. Obtain Architect's verification of final locations.
- B. Outlet boxes shall be sized per NEC to accommodate the installed number and size of conductors, wiring devices, and conduits.
- C. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- D. Typical boxes (for switches, receptacles and auxiliary systems): 4" square boxes ganged as required. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.
- E. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover. .
- F. Multiple Outlet Floor Boxes:
 - 1. Verify the exact location of the floor boxes with the Architect prior to rough-in.
 - 2. Set the boxes in accordance with the manufacturer's instructions.
 - 3. Boxes shall be set so that the box is flush with the finished floor; the boxes shall not cause a rise or fall in the floor.
 - 4. The power outlets shall be connected to the circuits indicated by the numbers next to the symbol.
 - 5. For Data outlets, install a 1" C. to above the nearest corridor ceiling.
- G. Boxes used with Exposed Conduit: 4" square utility boxes.
- H. Exterior Boxes: Cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney, or approved equal will be accepted.
- I. Boxes used with Recessed Lighting Fixtures in suspended acoustical tile ceilings:
 - 1. Provide a 4" square box with blank cover adjacent to each fixture or fixture group.
 - 2. Install a flexible metal conduit fixture-"whip" from the box to the fixtures. The "whip" shall not be longer than 72".
 - 3. Attach the box to the underside of the structure above, in an accessible location, not more than 18" above the lay-in ceiling.
 - 4. Where structure is more than 18" above the ceiling, the boxes shall be supported from all-thread rods, strut, or a combination of rod and strut.
- J. Boxes in Dry Wall Construction:
 - 1. Outlet boxes shall be securely fastened in place.
 - 2. Outlet boxes installed in metal stud construction shall be supported by brackets screwed to studs. Clip on brackets shall not be accepted.
 - a. Where a single outlet box is installed adjacent to a stud, brackets may attach to a single stud with a brace against the back of the opposite wall. Use a bracket equal to Caddy Fasteners "H" Series.
 - b. Where outlets do not fall next to a stud or where more than one outlet is installed between studs use a metal bracket attached to both studs. Brackets shall be equal to Caddy Fasteners "SGB", "TSGB", or "RBS" series brackets.
 - c. Outlet boxes three gangs and wider shall be supported with support member screwed to the two adjacent studs. Brackets equal to Caddy Fasteners SGB or TSGB brackets may be used.
- K. Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi- gang devices occur).
- L. Outlets in unfinished masonry walls may be slightly adjusted upward or downward to suit masonry courses, provided outlets are mounted at uniform heights throughout the installation.
- M. Coordinate installation of outlet boxes in masonry walls with the masonry contractor to insure that boxes are flush with face of wall and grouted smooth around boxes such that covers, fixtures or devices install flush on face of wall.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- N. Where outlets at different levels are shown adjacent, install in one vertical line where possible. Avoid conflict with wainscot caps, splash backs and upper cabinets by adjusting height slightly up or down as directed.
- O. Back to back boxes shall be staggered with at least 3 inches between boxes.
- P. Back to back boxes in fire rated partitions shall have a minimum of 24" horizontal and/or vertical separation between them.
- Q. Backs of boxes three gang and larger installed in fire rated partitions shall be wrapped with self adhesive fire stopping tape.
- R. Locate switch outlets on the lock side of doors and so that the first switch in a single or gang installation is approximately 6" to 10" from the doorjamb. Verify door swings on Architectural Drawings.
- S. Dimmers shall be ganged together in accordance with the manufacturer's instructions where appropriate but shall not be ganged with toggle switches.
- T. Coordinate carefully with appropriate trades the size and orientation (vertical, horizontal) of outlet boxes for thermostats, data outlets, fire alarm equipment, security equipment, and other control and communications outlets.
- U. Mounting Heights:
 Confirm all mounting height with local codes and authorities prior to bid and adjust as required:

Switches, generally	48" A.F.F. to top of outlet
Safety switches	Center of Switch 48" A.F.F. or as required.
Receptacles, generally	16" A.F.F. to bottom of outlet
Receptacles over counters	Bottom of outlet 6" above countertops or 2" above backsplashes
Comm Outlets	16" A.F.F. to bottom of outlet
Wall mounted exit and emergency lights	Bottom of fixture 7'- 6" A.F.F. or 12" below Ceiling whichever is lower
Thermostat	Top of outlet 48" A.F.F. or as noted by mechanical drawings.
Electric Water Coolers	Coordinate location with plumbing contractor to locate the receptacle(s) concealed within the EWC enclosure per manufacturer's installation instructions.
- V. Install blank coverplates on all unused power and auxiliary outlet boxes. Blank coverplates shall match other cover plates installed in the facility.
- W. Furnish blank plates, matching those on the other outlets in the same area, on TV outlets and other outlets installed for future use.

3.19. WIRING DEVICES:

- A. Install wall devices vertically unless otherwise noted, so that all devices of any given height will align exactly.
- B. Where boxes are not flush or square with the finished wall surface install wiring devices utilizing a leveler and retainer equal to Caddy #RLC or Steel City #SSF-SR.
- C. Plates shall be plumb and true with all four edges contacting wall surface.
- D. Mount receptacles with grounding terminals down.
- E. Do not install devices until plastering or other type wall covering has been completed; install ahead of painting work but protect from paint spatter.
- F. Use screw terminal connections only.

A New Community Center at
 Knox Street Park for the
 City of Troy
 Troy, Alabama

16100-Electrical

- G. Do not gang dimmer switches with toggle switches.
- H. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs and a minimum of 8 feet of Type SOW cable matching the receptacle size and configuration.
- I. Pin and sleeve plugs for food service equipment shall be provided with a Type SOW cable connected to the equipment and plug of sufficient length to reach from the equipment to the plug with a minimum of 18" slack cord. Minimum length shall be 6 feet from equipment to plug.
- J. Provide "Kellums" type grips at the plug, cord connector, and for overhead support on all overhead cord connector drops.

3.20. OCCUPANCY SENSORS AND ASSOCIATED DEVICES FOR LIGHTING CONTROL:

- A. Occupancy sensors and associated devices and circuiting shall be installed in strict accordance with the manufacturer's instructions.
- B. Wall, corner mounted sensors shall be mounted as close to the ceiling as possible on the manufacturer's corner mounting bracket.
- C. Power packs shall be mounted above the ceiling. Power packs shall be installed utilizing two(2) 4" x 4" x 2-1/8" deep boxes joined together using the nipple on the powerpack in accordance with the manufacturer's instructions. One of the boxes shall contain the power pack and control wiring and the other shall contain the power wiring.
- D. All control and power circuiting shall be in EMT conduit. Where the devices are not equipped with conduit connections the conduit shall be brought up as close as possible to the device and terminated with insulating bushings.

3.21. ELECTRICALLY POWERED EQUIPMENT AND CONTROLS:

- A. Provide and install power circuits for all electrically powered equipment and controls.
- B. Heating, Ventilating, and Air Conditioning Control Wiring and Conduit:
 - 1. The electrical contractor shall be responsible for installing outlet boxes for flush mounted HVAC system thermostats in dry wall or masonry wall construction and, where called for on the plans, for surface mounted metallic raceway in finished areas. Extend 3/4" conduit from the outlet to above nearest accessible ceiling and terminate horizontally. Refer to the Mechanical/HVAC plans for thermostat locations and coordinate exact type outlet required and orientation with the Mechanical/HVAC contractor.
 - 2. The Mechanical Contractor shall be responsible for the installation of all outlets and conduit for surface mounted devices in unfinished areas such as shops, warehouses, industrial facilities, etc.
 - 3. The mechanical contractor shall furnish and install all low and line voltage control wiring required for the temperature control and/or ventilation systems.
- C. Where Fire Alarm system duct mounted smoke detectors and HVAC shut down interface relays are provided, the Electrical contractor shall provide wiring from the smoke detectors to the HVAC shut down interface relay. All circuiting from the shut down relay to the HVAC controls and/or starters shall be provided and installed by the Mechanical/Controls contractor.
- D. The mechanical contractor shall furnish all motor starters for the temperature control and/or ventilation equipment unless otherwise indicated on the electrical plans or elsewhere in these electrical specifications. The electrical contractor shall install all motor starters, except for equipment with factory installed starters, for the temperature control and/or ventilation equipment.
- E. Where exhaust fans are supplied with field installed speed controllers, the Electrical Contractor shall provide all necessary circuiting to the fan/speed controller and between the fan and the speed controller.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

3.22. DISCONNECTING MEANS:

- A. Where required by the National Electrical Code and/or other applicable codes or authorities, or where indicated on the electrical plans, the electrical contractor shall furnish and install an approved disconnecting means for all electrically powered equipment and/or controllers for such equipment whether the disconnecting means is or is not shown on the electrical plans.
 - 1. The location, rating, and enclosure for the disconnecting means shall be as required by the National Electrical Code and/or other applicable codes or authorities.
 - 2. Manual motor starters with thermal overload protection may be used in lieu of safety switches for individual motors under 1 horsepower.
 - 3. Motor rated switches may be used for the disconnecting means when supplied of correct voltage, phase, amperage rating, and enclosure type.
 - 4. The disconnecting means shall be as manufactured by General Electric, Cutler Hammer, or Siemens. Square D will not be accepted.
- B. Where the disconnecting means shown on the electrical plans has a rating greater than the required code rating, the greater rating device shall be installed.
- C. An approved horsepower rated fusible safety switch shall be installed where the circuit overcurrent protection does not provide overload protection for the equipment served and where required to meet the equipment's listing requirements.
- D. Motor rated switches may be used as service disconnect switches when supplied with a pad-lockable, handle locking guard.
- E. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number). Plates shall be white with black lettering. The plates shall be permanently installed with stainless steel screws or stainless-steel rivets.
- F. All disconnects installed in public areas or in areas readily accessible to the public shall be lockable and shall be furnished with a brass lock. Provide 10 keys for each lock. All disconnect locks furnished on the project shall be keyed alike.

3.23. COMMUNICATIONS SYSTEMS:

- A. The Data Contractor shall have a BiCSI certified technician on the job at all times that system installation and/or testing is taking place.
- B. All cables shall be installed by the Data Contractor under the direct supervision of a BiCSI certified technician.
- C. Install a 1" conduit from each Data outlet box to above the nearest corridor ceiling and terminate with an insulating bushing. The conduit shall be run without pull boxes, junction boxes, or conduit bodies and no more than the equivalent of three (3) 90-degree bends.
- D. Each Data outlet shall have a Category 6 cable installed from each jack to the patch panel serving the area. Coordinate with drawings.
- E. Make all terminations at jacks and patch panel in accordance with industry standards.
- F. Cable installation:
 - 1. The rated cable pulling tension shall not be exceeded. Cable shall not be stressed such that twisting, stretching or kinking occurs. Cable shall not be spliced.
 - 2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
 - 3. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 12" shall be maintained when such placement cannot be avoided.
 - 4. All cables shall be terminated at both ends; no cable shall contain unterminated elements.
 - 5. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

6. Cable bending radius shall be 1" minimum. Minimum bending radius shall not be exceeded during installation or once installed.
7. Cables shall not come-in-contact with conduits, ceilings, lighting fixtures, ductwork, or water, sewer, or steam piping.
8. Cables routed above suspended ceilings shall be neatly bundled and supported with J-Hook Hangars attached to the building structure a maximum of 4 feet on center at not more than 24" above the suspended ceiling or in cable tray.
 - a. Cables shall be bundled together with nylon cable ties at 3' on-centers. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
 - b. Hangars shall be configured as required to attach to the structure, wall mounted, ceiling mounted, suspended from all thread rod, or supported on strut attached to the structure. Anchors attached to sheetrock shall not be acceptable.
 - c. Hangars shall be single or multiple tiered as required for the number of cables being supported.
 - d. At Corridor crossings or other locations where wall mounting is impractical hangers shall be double sided, single tier J-Hooks suspended on all-thread rods supported from the building structure or beam clamps at a maximum of 48" on centers.
9. Cables shall not be installed such that J-hooks are deflected, or such that cables are pulled tight against conduit walls where they exit the conduit.
10. Data cables shall not be bundled with, installed in j-hooks with, or installed in conduit with power circuiting, bell system circuiting, intercom system circuiting, or other auxiliary systems circuiting.
11. Cables routed through finished spaces which do not have suspended ceilings shall be installed in conduit. Routing of any exposed conduit shall be coordinated with the architect.
12. Above inaccessible ceilings, cables shall be installed in EMT conduits. Conduits shall be terminated at each end with insulating bushings. Each end of conduit shall be easily accessible.
13. Maximum number of Cat 6 cables in an EMT conduit shall comply with NEC.
14. On backboards cables shall be supported on "D" Rings at not more than 10" on centers. Cables shall be attached to the "D" rings in vertical runs with nylon tie wraps.
- G. Category 6 Cable Testing:
 1. All category 6 circuits shall be tested using a test set that meets the Class II accuracy requirements of TIA/EIA TSB 67 standard, including the additional tests and test set accuracy requirements of ANSI/TIA/EIA-568-A-5.
 2. Testing shall use the Basic Link Test procedure of TIA/EIA TSB 67, as supplemented by ANSI/TIA/EIA-568-A-5.
 3. All metallic cable pairs shall be tested for proper identification and continuity.
 4. All opens, shorts, crosses, grounds, and reversals shall be corrected. Correct color coding and termination of each pair shall be verified in the communications closet and at the outlet.
 5. Horizontal wiring shall be tested from and including the termination device in the communications closet to and including the modular jack in each room.
 6. Makes and model numbers of testing equipment shall be provided to the Engineer for approval prior to beginning installation.
 7. Each Category 6 cable shall be tested in accordance with ANSI/TIA/EIA TSB-67 for Link Performance Verification.
 8. Phone outlets with RJ11 terminations shall have a Cat 5e connector installed for testing. After testing and certification of the cable the cable shall be terminated on the telephone jack.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

9. Each Pair of conductors in each cable shall be tested for the following:
 - a. Wire Map
 - b. Length
 - c. Attenuation
 - d. Near End Crosstalk Loss (NEXT): Tested from both ends of cables.
 10. Any cable(s) not meeting the minimum standards of ANSI/TIA/EIA TSB-67 shall be removed and replaced.
 11. Results of the tests for each cable shall be printed out with the name of cable as affixed to the cable and terminals on site.
 12. A bound copy of all test results shall be provided to the Engineer and Owner prior to final inspection. The results shall be bound in protective sleeves in a three-ring binder.
- H. Labeling:
1. Cat 6 Cables:
 - a. Each jack, Cat 6 cable, and fiber optic cable shall be labeled with an alpha/numeric identifier with a corresponding identifier on the punch down block and/or patch panel.
 - b. The number shall include the alpha/numeric patch panel name and the alpha/numeric patch panel port name where the cable is terminated.
 - c. Labels shall be installed at each end of Cat 6 cables where terminated.
 - d. A floor plan of the facility shall be provided showing outlet locations and cable identifiers for each cable and the location of all patch panels with the corresponding identifiers.

3.24. LIGHTING FIXTURES:

- A. The installation and support of all lighting fixtures shall be the responsibility of the Electrical Contractor.
- B. Lay out work as shown, and to provide attractive and efficient arrangement.
- C. Install fixtures level, plumb, and true with ceiling and walls, and in alignment with adjacent lighting fixtures.
- D. Provide adequate and substantial supports for fixtures in accordance with manufacturers' directions and as specified herein.
- E. A Re-lock system will not be accepted for installing lights.
- F. Wire grid mounted luminaries individually to junction boxes with flexible conduit not more than 6 feet in length. Individual flexible connections shall be 2 #14 and 1 #14 ground THHN in 3/8" flexible conduit. Ground wire shall be bonded at each end.
- G. Light fixtures with center baskets shall have all fixtures in a room installed with the center baskets oriented in the same direction.
- H. Fixtures mounted in inverted "T" grids:
 1. For round fixtures or fixtures smaller in size than the ceiling grid, provide a minimum of two wires per fixture located within 4 inches of each corner of the ceiling grid in which the fixture is located. Do not support fixtures by ceiling acoustical panels. Fixtures shall be supported independent of the ceiling system or shall be supported by at least two metal channels spanning the grid system, and secured to, the ceiling tees. One support wire shall be attached to the center of the fixture or to each of the metal channels.
 2. Surface mounted fixtures:
 - a. Surface mounted fixtures installed on lay-in ceiling systems shall be supported independent of the ceiling system from the building structure with a minimum of two (2) 3/8", minimum, all-thread rods.
 - b. Install nuts and washers on inside and outside of the fixture housing to provide a rigid installation.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- c. Provide cross bracing as required such that fixtures have no lateral movement.
- I. All stems on lighting fixtures shall be installed as follows: (except fixtures with slide grip hangers) first and last stem in row in first knockout from end of fixture. One stem shall be installed between each two fixtures, stem shall center joint, where fixtures join, and attach by use of "jointing plates". Nipples with lock nuts and bushings shall connect all fixtures in continuous rows other than recessed grid type.
- J. All suspended lighting fixtures shall be provided with chain or cable sway bracing to keep fixtures from swinging.
- K. Fixtures installed in fire rated assemblies shall be tented in accordance with the specified assembly.
- L. Means shall be provided to keep insulation 4" minimum away from fixtures not rated for direct contact with insulation.
- M. Prior to final inspection clean fixtures and lamps with a soft cloth or sponge and detergent (not soap) solution.
- N. All lighting fixtures installed in gymnasiums, hangars, high bay or similar use areas shall be equipped with wire guards.
- O. All emergency and exit lights designated on drawings shall be provided with an 1100-lumen battery ballast.
- P. All light fixtures shall be supported to the structure independent of the ceiling system on two opposite sides. Support wires shall be different color from ceiling support wires. Engage all ceiling mounting clips. If light fixture is not provided with grid support clips, then the contractor will be responsible to support the fixture on all four sides with support wires. See "Typical Lay-In Luminaire Detail" on drawings for further requirements.

3.25. STEEL(ALUMINUM) POLE SETTING:

- A. Bases for poles shall be constructed as detailed on the drawings
- B. Anchor bolts shall be set plumb and centered in the base with adequate threads left exposed for base plate, backing nuts, washers, and locking nut.
- C. Poles shall be set plumb. Adjust backing and locking nuts to plumb pole with pole base held as close to concrete base as possible.
- D. Grout space between pole base plate and concrete base with non shrinking grout to provide a smooth finish.
- E. Smooth all nicks, scratches and scrapes and recoat with factory supplied or recommended primer coat and finish coat.

3.26. PANELBOARDS:

- A. Panelboards shall be installed where shown on the drawings.
- B. Ratings and configurations shall be as scheduled and/or indicated on the drawings.
- C. The Electrical Contractor shall coordinate installation of equipment in Electrical and Electrical/Mechanical spaces with other trades such that Code required clearances and working space around the electrical equipment is maintained.
- D. Conduit termination:
 - 1. In general use panelboards with blank ends, without knockouts.
 - 2. Layout conduit entries carefully to allow clearances for drywall or CMU wall thickness, and to accommodate the number and sizes of home run conduits and specified spare conduits.
 - 3. Use Greenlee Knock-Out punch, or equal, to cut holes in panelboard ends and/or sides for conduit installation. Do not drill holes or cut holes out with snips or torch.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- E. Phase arrangement in panelboards shall be per the NEC, phase A, B, C from front to back, top to bottom, or left to right as viewed from the front.
- F. In Delta connected systems the "high" leg shall be the B phase and shall be clearly marked with an orange outer finish.
- G. Multi-Section Panelboards:
 - 1. Sub-feed conductors shall be the same size as the conductors feeding the main section.
 - 2. Circuiting originating in one section shall not pass through another section.
 - 3. Circuit conductors and grounding conductors shall originate in the same panelboard section.
 - 4. A separate isolated grounding conductor shall be installed from the main section to the sub-feed section(s).
 - 5. Where the panelboard is rated for service entrance equipment the sub-feed section shall have a separate isolated ground buss fed from the main section ground buss.
- H. Labeling:
 - 1. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.
 - 2. Where there is more than one nominal voltage system the panel shall also have an engraved phenolic plate describing the means of identification used to identify the phase and system of each ungrounded conductor of the system served by the panel.
 - 3. Plates shall be white with black lettering.
 - 4. Panelboard circuit numbers shall be as indicated on the panelboard schedules.

3.27. PHOTOELECTRIC CELLS, TIMERS, AND CONTACTORS FOR LIGHTING CONTROL:

- A. Install time clocks where accessible.
- B. Install photoelectric cells so that lighting fixtures do not affect the cell.
- C. Adjust time clock(s) and photoelectric cells as required for proper operation.

3.28. IDENTIFICATION AND LABELING:

- A. Feeder Designation:
 - 1. Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switch gear and at termination of cables. Tags or labels shall be stamped or printed to correspond with markings on drawings so that feeder or cable number and phase can be readily identified.
 - 2. Where there is more than one nominal voltage system, each ungrounded system conductor shall be identified by phase and system wherever accessible per NEC. The means of identification shall be permanently posted at each branch-circuit panelboard.
- B. Color Coding of Conductors:
 - 1. The ungrounded (phase) conductors and the grounded (neutral) conductors of each voltage system shall be identified by the following color coding method:
 - a. 120/240 Volts, Single Phase, 3 Wire:
 - 1) Grounded (Neutral) Conductor --- White
 - 2) Ungrounded (Phase) Conductors --- Red, Black
 - b. 120/240 Volts, Three Phase, 4 wire:
 - 1) Grounded (Neutral) Conductor --- White
 - 2) Ungrounded (Phase) Conductors --- Red, Orange, Black
 - c. 120/208 Volts, 3 Phase, 4 Wire:
 - 1) Grounded (neutral) Conductor --- White
 - 2) Ungrounded (phase) Conductors --- Black, Blue, Red
 - d. 277/480 Volts, 3 Phase, 4 Wire:
 - 1) Grounded (neutral) Conductor --- Gray

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- 2) Ungrounded (phase) Conductors --- Brown, Orange, Yellow
 2. Green shall be used for equipment grounding conductors only.
 3. The insulation color shall be visible for the entire length of wire.
- C. Panelboard:
1. Each Lighting and Power Panelboard shall contain a typed circuit directory listing all circuit breakers and the load served by each.
 2. Panelboard directories shall be typewritten and shall include adequate descriptions for proper identification of individual circuits. Do not write in or on panelboards.
 3. On Distribution panelboards, provide and install an engraved laminated label for each circuit, indicating circuit's number and load served.
 4. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.
 5. Where there is more than one nominal voltage system each panelboard shall have an engraved phenolic plate describing the means of identification used to identify each phase, neutral, and grounding conductors of the system served by the panelboard per NEC.
 6. Plates shall be white with black lettering.
- D. Wall Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on the wall plate.
- E. Receptacles: Install a label on the face of the coverplate and tags or wire markers inside the outlet box identifying the panelboard and circuit number from which the outlet is served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of coverplate- black print on clear tape on light colored or stainless-steel plates and white print on clear tape on dark colored plates. Embossed tape labels will not be accepted. Use durable wire markers or tags within outlet boxes.
- G. Disconnect Switches:
1. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number).
 2. Plates shall be white with black lettering.
 3. The plates shall be permanently installed with stainless steel screws or stainless-steel rivets. Plates installed with glue or other adhesives will not be accepted.
 4. Where motor rated switches are used as service disconnect switches, labeling shall be as described for receptacles.
- H. Junction boxes: Identify circuits enclosed in concealed junction boxes on the cover with permanent marking pen.
1. For power and lighting circuits indicate panelboard of origin and panelboard circuit number(s).
 2. For auxiliary systems circuiting indicate the system and zone served.
- I. Service disconnects:
1. An additional engraved sign shall be permanently attached next to panelboard circuit breakers, on enclosed circuit breaker enclosures, and/or on disconnect switches used as service disconnects to identify each main service disconnect.
 2. The sign shall be red with white lettering a minimum of ½" high.
 3. Where multiple main disconnects are utilized the labels shall identify each as one of a group, i.e., "Service Disconnect 1 of 3", etc. where there are three service disconnects.

3.29. FIRE ALARM SYSTEM:

- A. The installation shall be by a Certified Fire Alarm Contractor who has qualified and received a permit from the State Fire Marshal, with an NICET Level III on staff.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- B. All wiring shall be in accordance with the National Electric Code and the local code having jurisdiction.
- C. Unless otherwise specified, minimum wire size shall be 14 gauge for AC and power supply connections, 14 gauge for audible alarm and auxiliary circuits, and 18 gauge for signal initiating circuits. Diagrams shall be provided for device and power wiring. Color coding and permanent numbering shall be used as recommended by the equipment supplier.
- D. All system wiring shall be installed in metal raceway in accordance with Section "Raceways".
- E. Junction boxes shall have covers painted red with the letters "FA" stenciled on the cover in 2" high white letters.
- F. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extender (NAC panel):
 - 1. Power supplies shall be sized at 133% of proposed load. Fire Alarm submittals shall include power supply capacity and loading data.
 - 2. Remote power supplies shall be supervised by the FACP.
 - 3. The power supplies shall be installed, accessible, below ceiling, in electrical rooms or where indicated on the drawings.
- G. Provide circuiting as required for the interface with the kitchen hood fire suppression system and the fire alarm system.
- H. Where air handler shut down is controlled from the fire alarm system, the fire alarm system installer shall provide circuiting as required between the Duct Mounted Smoke Detectors and the HVAC interface/shut down relays. Circuiting connecting the relay output contacts to the HVAC control system shall be provided and installed by the Mechanical/Controls contractor.
- I. Each air handling unit shall be a separate fire alarm initiating zone.
- J. Install wire guards on all smoke detectors and notification devices installed in gymnasiums or similar use areas.
- K. **Install UL fire listed cellular communicator for monitoring of the fire alarm system. Provide all material and labor as needed for complete functioning system at the completion of construction.**
- L. Final connections to the Fire Alarm Control Panel **and Voice Panel** shall be made by a factory certified, NICET Level III, technician.
- M. A factory-trained representative of the manufacturer shall supervise connections and final testing of this system and shall complete a Certificate of Completion per NFPA 72. The Certificate of Completion shall be completely filled out and copies delivered to the Owner, Architect, and Engineer prior to the final inspection.
- N. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.
- O. **At the acceptance tests, contractor shall provide engineer with smoke detector diagnostic reports for all smoke detectors. All smoke detectors more than 10% dirty shall be either cleaned or replaced until test show value less than 10%.**
- P. The fire alarm system shall be warranted free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy, whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.
- Q. Identification and labeling:
 - 1. Provide a framed building drawing identifying each zone and/or building area.
 - 2. Each building zone on the Fire Alarm Control panel shall relate to the building drawing in a manner that will direct the fire department to the area of a fire.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

3. On addressable systems each addressable device shall be given a name displayed on the control panel readout that will direct the fire department to the area of the fire, i.e. – South End of Zone(Building) 5; AHU-1 – Mechanical Room 201 – Building 2. Any room number reference shall be to final room numbers assigned to rooms on completion of construction.
4. Building drawing, schedule of zones, and device identification schedule shall be submitted to the Engineer for approval prior to final inspection and acceptance.
5. On addressable systems the contactor shall label each device with an alpha-numeric identifier that is unique to that device. This identifier shall correspond to the identifier programmed in the fire alarm control panel such that maintenance personnel may quickly and readily identify the device.

3.30. SECONDARY SURGE ARRESTERS:

- A. Secondary surge arresters shall be installed in strict accordance with the manufacturer's recommendations.
- B. Arrester may be mounted to the side of a surface mounted panelboard or trough. If such a surface is not available, the arrester shall be mounted on a bracket in its own flush mount enclosure located immediately adjacent to the service panel. Ensure that all leads are attached per manufacturer's recommendations. Excess lead length shall be cut off prior to making connections.

3.31. CONCRETE:

- A. The Electrical Contractor shall be responsible for placing concrete for electrical equipment pads, lighting standard bases, electrical equipment supports, and at other locations as indicated on the electrical drawings and/or specified herein.
- B. This Contractor shall be responsible for size, location, and orientation of the pads, bases, etc. Any required additions or modifications to concrete due to incorrect size, location, or orientation shall be the responsibility of this contractor.
- C. Concrete shall be cured for a period of not less than seven (7) days prior to setting poles, transformers, switchgear, motor control centers, or other pad mounted equipment.
- D. Forms shall be completely removed after concrete has cured and prior to setting equipment.
- E. A smooth wood float finish shall be given to exposed, unformed concrete.
- F. Honeycombed, or otherwise defective areas of concrete shall be repaired by patching with cement mortar.

3.32. SPARE MATERIAL:

- A. Provide two exit signs and 50 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- B. Provide two emergency wall packs and 50 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- C. Provide two type NEMA 5-20R receptacles complete with 75 feet of circuiting in conduit . For each device provide complete with all additional labor and materials for installation in a location as directed by the architect or engineer.
- D. Provide two duplex communications outlets complete with all labor, material, cabling and conduit necessary to install outlet 300 feet from the nearest communications IDF closet and terminate outlet cables on patch panels in rack. Outlets to be installed in a location as directed by architect or engineer.

A New Community Center at
Knox Street Park for the
City of Troy
Troy, Alabama

16100-Electrical

- E. Provide one of each type of fire alarm notification devices (speaker/strobe units, strobe only units) and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.
- F. Provide two of each type of CO detector and 150 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- G. Provide two of each type of fire alarm heat detector devices and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.
- H. Provide two of each type of initiating device (pull station, zone module, duct detector, smoke detector) and 75 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- I. Provide one spare set of fuses for each size and type fuse used.

3.33. EQUIPMENT TOUCHUP AND PAINTING:

- A. Clean damaged and disturbed areas on all painted surfaces of enclosures, cabinets, and equipment, sand smooth, and apply primer, intermediate, and finish coats of paint to suit the degree of damage at each location. Paint shall be the manufacturer's supplied touch up paint or a matching paint. Prep all surfaces to be painted by removing all rust, dirt, oil, and any other material that might inhibit good paint adhesion by mechanical means and/or with solvents.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
- C. Repair damage to galvanized finishes with two coats of zinc-rich paint recommended by manufacturer.
 - 1. Paint cut ends.
 - 2. Paint all drilled and punched holes.
 - 3. Paint all knicks and scratches.
 - 4. Paint all field cut conduit threads.
- D. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION