MDOT Use Only

Checked _____

Loaded _____

Keyed _____

7 -

SM No. CBWO9718250011

PROPOSAL AND CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

(STATE DELEGATED)

7
Construction of a Shop Building for the Materials Laboratory in Jackson, known as State Project Nos. BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302, in Hinds County.
Project Completion: January 31, 2013

NOTICE

BIDDERS MUST PURCHASE A BOUND PROPOSAL FROM MDOT CONTRACT ADMINISTRATION DIVISION TO BID THIS PROJECT.

Electronic addendum updates will be posted on www.gomdot.com

SECTION 900

OF THE CURRENT
(2004) STANDARD SPECIFICATIONS
FOR ROAD AND BRIDGE CONSTRUCTION
MISSISSIPPI DEPARTMENT OF TRANSPORTATION

JACKSON, MISSISSIPPI

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3586 **CODE: (SP)**

DATE: **06/22/2011**

SUBJECT: **Readvertisement**

PROJECT: **BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302 – Hinds County**

The contents of this proposal are the same as when advertised for the **May, 2011** Letting, except as follows:

Revised Advertisement;

Revised Special Provision No. 907-242-25;

Add this Notice to Bidders No. 3586.

BIDDER CHECK LIST
(FOR INFORMATION ONLY)

_____ All unit prices and item totals have been entered in accordance with Subsection 102.06 of the Mississippi Standard Specifications for Road and Bridge Construction.

_____ If the bid sheets were prepared using the Electronic Bid System, proposal sheets have been stapled and inserted into the proposal package.

_____ First sheet of SECTION 905--PROPOSAL has been completed.

_____ Second sheet of SECTION 905--PROPOSAL has been completed and signed.

_____ Addenda, if any, have been acknowledged. Second sheet of Section 905 listing the addendum number has been substituted for the original second sheet of Section 905. Substituted second sheet of Section 905 has been properly completed, signed, and added to the proposal.

_____ DBE/WBE percentage, when required by contract, has been entered on last sheet of the bid sheets of SECTION 905 - PROPOSAL.

_____ Form OCR-485, when required by contract, has been completed and signed.

_____ The last sheet of the bid sheets of SECTION 905--PROPOSAL has been signed.

_____ Combination Bid Proposal of SECTION 905--PROPOSAL has been completed for each project which is to be considered in combination (See Subsection 102.11).

_____ Equal Opportunity Clause Certification, when included in contract, has been completed and signed.

_____ The Certification regarding Non-Collusion, Debarment and Suspension, etc. has been executed in duplicate.

_____ A certified check, cashier's check or bid bond payable to the State of Mississippi in the principal amount of 5% of the bid has been included with project number identified on same. A bid bond has been signed by the bidder and has also been signed or countersigned by a Mississippi Agent or Qualified Nonresident Agent for the Surety with Power of Attorney attached.

_____ ON FEDERAL FUNDED PROJECTS, the Notice To Bidders regarding DUNS Requirements has been completed and included in the contract documents.

_____ Non-resident Bidders: ON STATE FUNDED PROJECTS ONLY, a copy of the current laws regarding any preference for local Contractors from State wherein domiciled has been included. See Subsection 103.01, Mississippi Standard Specifications for Road and Bridge Construction, and Section 31-7-47, MCA, 1972 regarding this matter.

Return the proposal and contract documents in its entirety in a sealed envelope. DO NOT remove any part of the contract documents; exception - an addendum requires substitution of second sheet of Section 905. A stripped proposal is considered as an irregular bid and will be rejected.

Failure to complete any or all of the applicable requirements will be cause for the proposal to be considered irregular.

(04/2011)

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

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PROPOSAL BID SHEETS,
COMBINATION BID PROPOSAL,
STATE BOARD OF CONTRACTORS REQUIREMENTS,
CERTIFICATION REGARDING NON-COLLUSION, DEBARMENT AND SUSPENSION,
SECTION 902 - CONTRACT FORM, AND SECTION 903 - CONTRACT BOND FORM,

(REVISIONS TO THE ABOVE WILL BE INDICATED ON THE SECOND SHEET OF SECTION 905 AS ADDENDA)

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 901 - ADVERTISEMENT

Sealed bids will be received by the Mississippi Transportation Commission in the Office of the Contract Administration Engineer, Room 1013, Mississippi Department of Transportation Administration Building, 401 North West Street, Jackson, Mississippi, until 10:00 o'clock A.M., Tuesday, July 26, 2011, and shortly thereafter publicly opened on the Sixth Floor for:

Construction of a Shop Building for the Materials Laboratory in Jackson, known as State Project Nos. BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302, in Hinds County.

The attention of bidders is directed to the predetermined minimum wage rate set by the U. S. Department of Labor under the Fair Labor Standards Act.

The Mississippi Department of Transportation hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, sex, age, disability, religion or national origin in consideration for an award.

Plans and specifications are on file in the offices of the Mississippi Department of Transportation.

Bid proposals must be acquired from the MDOT Contract Administration Division. These proposal are available at a cost of Ten Dollars ($10.00) per proposal. Specimen proposals are also available at the MDOT Contract Administration Division at a cost of Ten Dollars ($10.00) per proposal, or can be viewed or downloaded at no cost at www.gomdot.com.

Plans may be acquired on a cost per sheet basis from MDOT Plans Print Shop, MDOT Shop Complex, Building C, Room 114, 2567 North West Street, Jackson, Mississippi 39216, Telephone (601) 359-7460 or e-mail at plans@mdot.state.ms.us or FAX (601) 359-7461. Plans will be shipped upon receipt of payment.

Bid bond, signed or countersigned by a Mississippi Agent or Qualified Nonresident Agent, with Power of Attorney attached or on file with the Contract Administration Engineer of the Department, a Cashier's check or Certified Check for five (5%) percent of bid, payable to STATE OF MISSISSIPPI, must accompany each proposal.

The attention of bidders is directed to the provisions of Subsection 102.07 pertaining to irregular proposals and rejection of bids.

MELINDA L. MCGRATH
INTERIM EXECUTIVE DIRECTOR

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 1 **CODE: (IS)**

DATE: **05/03/2004**

SUBJECT: **Governing Specifications**

The current (2004) Edition of the Standard Specifications for Road and Bridge Construction adopted by the Mississippi Transportation Commission is made a part hereof fully and completely as if it were attached hereto, except where superseded by special provisions, or amended by revisions of the Specifications contained herein. Copies of the specification book may be purchased from the MDOT Construction Division.

A reference in any contract document to controlling requirements in another portion of the contract documents shall be understood to apply equally to any revision or amendment thereof included in the contract.

In the event the plans or proposal contain references to the 1990 Edition of the Standard Specifications for Road and Bridge Construction, it is to be understood that such references shall mean the comparable provisions of the 2004 Edition of the Standard Specifications.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3 **CODE: (SP)**

DATE: **05/03/2004**

SUBJECT: **Final Clean-Up**

Immediately prior to final inspection for release of maintenance, the Contractor shall pick up, load, transport and properly dispose of all litter from the entire highway right-of-way that is within the termini of the project.

Litter shall include, but not be limited to, solid wastes such a glass, paper products, tires, wood products, metal, synthetic materials and other miscellaneous debris.

Litter removal is considered incidental to other items of work and will not be measured for separate payment.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 640 **CODE: (IS)**

DATE: 09/26/2005

SUBJECT: Fiber Reinforced Concrete

Bidders are hereby advised that synthetic structural fibers meeting the requirements of Subsection 907-711.04 may be used in lieu of wire mesh in some items of construction. Substitution of fibers for wire mesh will be allowed in the construction of paved ditches, paved flumes, paved inlet apron, driveways, guard rail anchors and pile encasements. Substitution in any other items of work must be approved by the State Construction Engineer prior to use.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 777 **CODE: (IS)**

DATE: 04/13/2006

SUBJECT: On-The-Job Training Program

Payment for training hours will be handled as outlined in Special Provision 906-6. A pay item for trainees will not be included in individual construction projects. Payment for training individuals will be processed in accordance with the conditions in MDOT's ON-THE-JOB TRAINING PROGRAM (Special Provision 906-6).

On Federal-Aid projects, failure on the part of the Contractor to carryout the terms of the Alternate Training Special Provision (Special Provision 906-6) will be considered grounds to preclude the Contractor from participating in the Alternate On-The-Job Training Program. In the event the Department is required to preclude the Contractor from participating in the program, the Contractor will be required to adhere to the requirements of the Training Special Provision (Special Provision 906-3), for which purpose the special provision is also made a part of this proposal.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 883 **CODE: (IS)**

DATE: **04/28/2006**

SUBJECT: **Payroll Requirements**

Bidders are hereby advised that the Contractor and Subcontractor(s) are required to submit payroll information to the Project Engineers on a weekly basis.

On Federal-Aid Projects, CAD-880, CAD-881 and certified payroll submissions are required each week the Contractor or a Subcontractor performs work on the project. This is addressed in Section V, page 6 of Form FHWA-1273.

On State-Funded Projects, CAD-880 is required each week the Contractor or a Subcontractor performs work on the project.

When no work is performed on either Federal-Aid and State-Funded Projects, the Contractor should only submit CAD-880 showing no work activities.

The Contractor shall make all efforts necessary to submit this information to the Project Engineer in a timely manner. The Engineer will have the authority to suspend the work wholly or in part and to withhold payments because of the Contractor's failure to submit the required information. Submission of forms and payrolls shall be current through the first full week of the month for the estimate period in order for the Project Engineer to process an estimate.

Bidders are advised to review the requirements regarding payroll submissions in Section 110 of the Standard Specifications.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 1405 **CODE: (IS)**

DATE: **03/15/2007**

SUBJECT: ERRATA AND MODIFICATIONS TO THE 2004 STANDARD SPECIFICATIONS

Page	Subsection	Change
101	201.01	In the second sentence of the first paragraph, change “salvable” to “salvageable”.
107	202.04	In the fourth sentence of the fourth paragraph, change “yard” to “feet”.
107	202.05	In the list of units measurements for 202-B, add “square foot”.
132	211.03.4	In the second sentence of the second paragraph, change “planted” to “plated”.
192	306.02.4	In the first line of the first paragraph, delete the word “be”.
200	307.03.7	In the fourth sentence of the second paragraph, change “lime-fly ash” to “treated”.
236	401.01	Change the header from “Section 403” to “Section 401”.
242	401.02.3.2	In the first sentence of the third full paragraph, add “1/8” in the blank before the inch mark.
250	401.02.6.3	In the second sentence of the first paragraph on page 250, change “rutting over ” ” to “rutting over 1/8" ”.
253	401.02.6.4.2	In the paragraph preceding the table, change “91.0” to “89.0”.
259	401.03.1.4	In the first paragraph, change “92.0 percent” to “the specified percentage (92.0 or 93.0)”.
269	403.03.2	In the table at the top of page 269, change the PI requirement from “ = ” to “ $\leq$ ”.

278	404.04	In the second sentence, change the subsection from "401.04" to "403.04".
283	409.02.2	Change "PG 64-22" to "PG 67-22".
294	413.02	In the first sentence of the second paragraph, change "707.02.1.3" to "Subsection 707.02.1.3".
340	511.04	In the second sentence of the second paragraph, change "412" to "512".
349	601.03.3	In the first sentence, change "804.03.2" to "804.03.5".
355	603.02	Change the subsection reference for Joint mortar from "707.03" to "714.11".
369	604.04	In the first sentence, change "601.04" to "Subsection 601.04".
427	619.04	Delete the second paragraph.
442	625.04	In the third paragraph, change "626.04" to "Subsection 626.04".
444	626.03.1.2	Delete the third sentence of the first paragraph.
464	631.02	Change the subsection reference for Water from "714.01.0" to "714.01.1".
570	682.03	Change the subsection number from "682-03" to "682.03".
575	683.10.4	Change the subsection number from "683.10.4" to "683.04".
575	683.10.5	Change the subsection number from "683.10.5" to "683.05".
596	701.02	In the table under the column titled "Cementations material required", change Class F, FA" to "Class F FA,".
603	702.11	In the first sentence, change "702.12" to "Subsection 702.12".
612	703.04.2	In the fifth paragraph, delete "Subsection 703.11 and".
616	703.07.2	In the Percentage By Weight Passing Square Mesh Sieves table, change the No. 10 requirement for Class 7 material from "30 - 10" to "30 - 100".

618	703.13.1	In the first sentence of the first paragraph, change "703.09" to "703.06".
618	703.13.2	In the first sentence, change "703.09" to "703.06".
671	712.06.2.2	In the first sentence, change "712.05.1" to "Subsection 712.05.1".
689	714.11.2	In the first sentence, change "412" to "512".
709	715.09.5	In the first sentence of the first paragraph, change "guage" to "gauge".
717	717.02.3.4	In the top line of the tension table, change "1 1/2" to "1 1/8" and change "1 1/8" to "1 1/2".
741	720.05.2.2	In the last sentence of this subsection, change "720.05.2.1" to "Subsection 720.05.2.1".
827	803.03.2.3.7.5.2	In the first sentence of the second paragraph, change "803.03.5.4" to "803.03.2.3.4".
833	803.03.2.6	In the first sentence, change "803.03.7" to "803.03.2.5".
854	804.02.11	In the last sentence of the first paragraph, change "automatically" to "automatic".
859	804.02.13.1.3	In the last sentence, change Subsection "804.02.12.1" to "804.02.12".
879	804.03.19.3.2	In the first sentence of the third paragraph, change "listed on of Approved" to "listed on the Approved".
879	804.03.19.3.2	In the last sentence of the last paragraph, change "804.03.19.3.1" to "Subsection 804.03.19.3.1".
962	814.02.3	In the first sentence, change "710.03" to "Subsection 710.03".
976	820.03.2.1	In the first sentence, change "803.02.6" to "803.03.1.7".
976	820.03.2.2	In the first sentence, change "803.03.9.6" to "803.03.1.9.2".
985	Index	Change the subsection reference for Petroleum Asphalt Cement from "702.5" to "702.05".

985	Index	Change the subsection reference for the Definition of Asphaltic Cement or Petroleum Asphalt from "700.2" to "700.02".
985	Index	Change the subsection reference for Automatic Batchers from "501.03.2.4" to "804.02.10.4".
986	Index	Delete "501.03.2" as a subsection reference for Batching Plant & Equipment.
988	Index	Change the subsection reference for the Central Mixed Concrete from "501.03.3.2" to "804.02.11".
988	Index	Change the subsection reference for the Concrete Batching Plant & Equipment from "501.03.2" to "804.02.11".
999	Index	Delete "501.03.3.3" as a subsection reference for Truck Mixers.
1001	Index	Change the subsection reference for Edge Drain Pipes from "605.3.5" to "605.03.5".
1002	Index	Change the subsection reference for Metal Posts from "713.05.2" to "712.05.2".
1007	Index	Change the subsection reference for Coarse Aggregate of Cement Concrete Table from "703.3" to "703.03".
1007	Index	Change the subsection reference for Composite Gradation for Mechanically Stabilized Courses Table from "703.8" to "703.08".
1009	Index	Delete "501.03.3.3" as a subsection reference for Truck Mixers and Truck Agitators.
1010	Index	Delete reference to "Working Day, Definition of".

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 1808 **CODE: (IS)**

DATE: **09/09/2008**

SUBJECT: **Safety Apparel**

Bidders are advised that the Code of Federal Regulations CFR 23 Part 634 final rule was adopted November 24, 2006 with an effective date of November 24, 2008. This rule requires that **"All workers within the right-of-way of a Federal-Aid Highway who are exposed either to traffic (vehicles using the highway for the purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel"**. High-visibility safety apparel is defined in the CFR as **"personnel protective safety clothing that is intended to provide conspicuity during both daytime and nighttime usage, and that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004 publication entitled American National Standard for High-Visibility Safety Apparel and Headwear"**. All workers on Mississippi State Highway right-of-way shall comply with this Federal Regulation. Workers are defined by the CFR as **"people on foot whose duties place them within the right-of way of a Federal-Aid Highway, such as highway construction and maintenance forces, survey crews, utility crews, responders to incidents within the highway right-of-way, and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way of a Federal-Aid Highway"**.

You can access this final rule at the following link:
http://a257.g.akamaitech.net/7/257/2422/01jan20061800/edocket.access.gpo.gov/2006/pdf/E6-19910.pdf

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 1928 **CODE: (IS)**

DATE: **04/14/2008**

SUBJECT: **Federal Bridge Formula**

Bidders are hereby advised that Federal Highway Administration Publication No. FHWA-MC-94-007, **BRIDGE FORMULA WEIGHTS**, dated January 1994, is made a part of this contract when applicable.

Prior to the preconstruction conference, the Contractor shall advise the Engineer, in writing, what materials, if any, will be delivered to the jobsite via Interstate route(s).

Copies of the **BRIDGE FORMULA WEIGHTS** publication may be obtained by contacting:

Federal Highway Administration
400 7th Street, SW
Washington, DC 20590
(202) 366-2212

or

http://ops.fhwa.dot.gov/freight/sw/brdgcalc/calc_page.htm

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 2774 **CODE: (SP)**

DATE: **08/27/2009**

SUBJECT: **Use of Precast Drainage Units**

Bidders attention is brought to the content of Subsection 601.02.3 regarding precast units. The Contractor must make a request to the Project Engineer for approval to use precast units prior to installation.

Precast drainage units shall meet the requirements of Drawing Sheet No. PCU-1 or PCU-2, as applicable.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 2818 **CODE: (SP)**

DATE: **10/01/2009**

SUBJECT: **Non-Quality Control / Quality Assurance Concrete**

Bidders are advised that the following pay items will not be accepted based on the Quality Control / Quality Assurance (QC/QA) requirements of Section 804 of the specifications. The acceptance of these pay items will be based on sampling and testing at the project site by MDOT forces. The Contractor is required to submit mix designs to accomplish this work in accordance with Section 804 and perform normal Quality Control functions at the concrete plant. Acceptance will be in accordance with the requirements of 907-601, Structural Concrete, and TMD-20-04-00-000. At the discretion of the Engineer, the Contractor may request that the concrete be accepted based on QC/QA requirements.

Pay Item	Description
221	Paved Ditches
601	Minor Structures - manholes, inlets, catch basins, junction boxes, pipe headwalls, and pipe collars.
606	Guardrail Anchors
607	Fence Post Footings
608	Sidewalks
609	Curb and Gutter
614	Driveways
616	Median and Island Pavement
630	Sign Footings, except Overhead Sign Supports

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 2858 **CODE: (SP)**

DATE: **11/12/2009**

SUBJECT: **Petroleum Products Base Prices**

Bidders are advised that the Notice To Bidders entitled "Monthly Petroleum Products Base Prices" previously included in the proposal documents will no longer be a printed part of the proposal beginning with the January 2010 letting. Monthly petroleum products base prices will be available at the web site listed below. Current monthly prices will be posted to this web site on or before the 15th of each month. Bidders are advised to use the petroleum base prices on this web site when preparing their bids. The current monthly petroleum products base prices will become part of the contract during the execution of the contract.

Monthly Petroleum Products Base Prices can be viewed at:

http://www.gomdot.com/Applications/BidSystem/Home.aspx

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3039 **CODE: (SP)**

DATE: **03/23/2010**

SUBJECT: **Alternate Asphalt Mixture Bid Items**

Bidders are advised that the asphalt mixture used on this project will be bid as an alternate pay item: Hot Mix Asphalt (HMA) or Warm Mix Asphalt (WMA). Bidders must select one of the alternates at the time of bid. **The Contractor must use the selected asphalt mixture, HMA or WMA, throughout the entire project.**

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3067 **CODE: (SP)**

DATE: 04/14/2010

SUBJECT: Storm Water Discharge Associated with Construction Activity (≥ 1 and < 5 Acres)

Construction Storm Water General NPDES Permit MSR 15 to discharge storm water associated with construction activity is required. This project is granted permission to discharge treated storm water into State waters. Copies of said permit and Storm Water Pollution Prevention Plan (SWPPP) are on file with the Department.

Prior to the execution of the contract, the successful bidder shall execute and deliver to the Executive Director an original signed copy of the completed Prime Contractor Certification (Form No. 1).

Failure of the bidder to execute and file the completed Prime Contractor Certification (Form No. 1) shall be just cause for the cancellation of the award.

The executed Prime Contractor Certification (Form No. 1).shall be prima facie evidence that the bidder has examined the permit, is satisfied as to the terms and conditions contained therein, and that the bidder has the primary responsibility for meeting all permit terms and conditions including, but not limited to, the inspection and reporting requirements of Part IV. For this project, the Contractor shall furnish, set up and read, as needed, an on-site rain gauge.

The Contractor must furnish the Project Engineer a completed copy of the Small Construction Notice of Intent (SCNOI) along with the Contractor's Erosion Control Plan.

The Contractor shall make inspections in accordance with condition No. S-4, Page 13, and shall furnish the Project Engineer with the results of each weekly inspection as soon as possible following the date of inspection. The weekly inspections must be documented monthly on the Inspection and Certification Form, a copy of which is provided. The Contractor's representative and the Project Engineer shall jointly review and discuss the results of the inspections so that corrective action can be taken. The Project Engineer shall retain copies of the inspection reports.

The Engineer will have the authority to suspend all work and/or withhold payments for failure of the Contractor to carry out provisions of MDEQ's Storm Water Construction General Permit, the erosion control plan, updates to the erosion control plan, and /or proper maintenance of the BMPs.

Securing a permit (s) for storm water discharge associated with the Contractor's activity on any other regulated area the Contractor occupies, shall be the responsibility of the Contractor.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3242 **CODE: (SP)**

DATE: **09/21/2010**

SUBJECT: **Warm Mix Asphalt**

Bidders are advised that MDOT approved products and processes for the production of Warm Mix Asphalt is available at the following MDOT website.

http://www.gomdot.com/Divisions/Highways/Resources/MPL/Home.aspx

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3425 **CODE: (SP)**

DATE: **03/01/2011**

SUBJECT: **Questions Regarding Bidding**

Bidders are advised that all questions that arise regarding the contract documents or plans on this project shall be directed to the Construction Division at 601-359-7301.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3475 **CODE: (SP)**

DATE: **06/15/2011**

SUBJECT: **Contract Time**

PROJECT: **BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302 -- Hinds County**

The calendar date for completion of work to be performed by the Contractor for this project shall be **January 31, 2013** , which date or extended date as provided in Subsection 907-108.06 shall be the end of contract time. It is anticipated that the Notice of Award will be issued no later than **August 9, 2011** and the effective date of the Notice to Proceed / Beginning of Contract Time will be **September 8, 2011**.

Should the Contractor request a Notice to Proceed earlier than **September 8, 2011**, and it is agreeable with the Department for an early Notice to Proceed, the requested date will become the new Notice to Proceed / Beginning of Contract Time date.

A progress schedule as referenced to in Subsection 907-108.03 will not be required for this contract.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 904 - NOTICE TO BIDDERS NO. 3582 **CODE: (SP)**

DATE: **06/15/2011**

SUBJECT: **Cooperation Between Contractors**

PROJECT: **BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302 – Hinds County**

The Bidder's attention is hereby called to Subsection 105.07, Cooperation between Contractors, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction.

The Bidder is advised that the security and surveillance systems for this building shall be installed by others under a separate contract and coordinated under this contract. See specification sections in Division 28 for detailed information and responsibilities.

The Contractor shall cooperate in all respects and shall coordinate construction of all phases of work of this project with the Contractor installing the security and surveillance systems.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-101-4 **CODE: (IS)**

DATE: **11/05/2008**

SUBJECT: **Definitions**

Section 101, Definitions and Terms, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-101.02--Definitions. Replace the following definitions in Subsection 101.02 on pages 3 through 13.

Contract - The written agreement between the Mississippi Transportation Commission and the Contractor setting forth the obligations of the parties thereunder, including but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract includes the invitation for bids, proposal, contract form and contract bonds, specifications, supplemental specifications, interim specifications, general and detailed plans, special provisions, notices to bidders, notice to proceed, and also any agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

Contract Bonds - The approved form of security, executed by the Contractor and the Contractor's Surety(ies), guaranteeing complete execution of the contract and all supplemental agreements pertaining thereto and the payment of all legal debts pertaining to the construction of the project. This term includes Performance and Payment Bond(s).

Surety - A corporate body, qualified under the laws of Mississippi, which is bound with and for the successful bidder by "contract bond(s)" to guarantee acceptable performance of the contract and payment of all legal taxes and debts pertaining to the construction of the project, including payment of State Sales Tax as prescribed by law, and any overpayment made to the Contractor.

Add the following to the list of definitions in Subsection 101.02 on pages 3 through 13.

Performance Bond - The approved form of security, executed by the Contractor and issued by the Contractor's Surety(ies), guaranteeing satisfactory completion of the contract and all supplemental agreements pertaining thereto.

Payment Bond - The approved form of security, executed by the Contractor and issued by the Contractor's Surety(ies), guaranteeing the payment of all legal debts pertaining to the construction of the project including, but not limited to, the labor and materials of subcontractors and suppliers to the prime contractor.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-102-8 **CODE: (IS)**

DATE: 01/20/2011

SUBJECT: Bidding Requirements and Conditions

907-102.06--Preparation of Proposal. Delete the fifth, sixth, and seventh paragraphs of Subsection 102.06 on page 18 and substitute the following:

Bid sheets generated by the Department's Electronic Bid System (Trns•port Expedite Bid) along with a completed proposal package will constitute the official bid and shall be signed on the last sheet of the Expedite Bid generated bid sheets and delivered to the Department in accordance with the provisions of Subsection 102.09.

Bidders are cautioned that using other versions of the Expedite Bid may result in improperly printed bid sheets. The correct version of Expedite Bid can be obtained at no cost from the MDOT Contract Administration Division or at the MDOT website, www.gomdot.com.

If bidders submit Expedite Bid generated bid sheets, then the bid sheets included in the proposal should not be completed. The Expedite Bid generated bid sheets should be stapled together, signed and included in the bid proposal package in the sealed envelope. If both the forms in the proposal and the Expedite Bid generated bid sheets are completed and submitted, only the Expedite Bid generated sheets will be recognized and used for the official bid. The USB Flash Drive containing the information printed on the Expedite Bid generated bid sheets should be placed in the padded envelope included with the bid proposal package and enclosed in the sealed envelope. Bid sheets printed from Expedite Bid should be a representation of the data returned on the flash drive. To have a true representation of the bid sheets, the Bidder must copy the EBS and EBS amendment files used to prepare the bid sheets to the flash drive. Otherwise, the unit prices bid will not be recorded to the flash drive. Bidders are cautioned that failure to follow proper flash drive handling procedures could result in the Department being unable to process the flash drive. Any modification or manipulation of the data contained on the flash drive, other than entering unit bid prices and completing all required Expedite Bid sections, will not be allowed and will cause the Contractor's bid to be considered irregular.

907-102.08--Proposal Guaranty. Delete the first and second paragraphs in Subsection 102.08 on page 20 and substitute the following:

No proposal will be considered unless accompanied by certified check, cashier's check or bid bond, made payable to the State of Mississippi, in an amount of not less than five percent (5%) of the total amount of the proposal offered. The guaranty shall be evidence of good faith that, if awarded the contract, the bidder will execute the contract and give performance and payment contract bond(s) as stipulated in Subsection 907-103.05.1, 907-103.05.2, and as required by law.

If a bid bond is offered as guaranty, the bond must be on a form approved by the Executive Director, made by a Surety acceptable to the Executive Director and signed or countersigned by a Mississippi Agent or Qualified Nonresident Agent and the Bidder. Such bid bond shall also conform to the requirements and conditions stipulated in Subsection 907-103.05.2 as applicable.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-103-8 **CODE: (SP)**

DATE: **12/15/2009**

SUBJECT: **Award and Execution of Contract**

Section 103, Award and Execution of Contract, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-103.04--Return of Proposal Guaranty. Delete the second paragraph of Subsection 103.04 on page 23 and substitute the following:

Certified checks or cashier's checks submitted as proposal guaranties, except those of the two lowest bidders, will be returned within 10 days of contract award. The retained proposal guaranty of the unsuccessful of the two lowest bidders will be returned within ten days following the execution of a contract with the successful low bidder. The retained proposal guaranty of the successful bidder will be returned after satisfactory performance and payment bonds have been furnished and the contract has been executed.

In the event all bids are rejected by the Commission, certified checks or cashier's checks submitted as proposal guaranty by all bidders will be returned within 10 days of rejection.

Delete Subsection 103.05 on page 23 and substitute the following:

907-103.05--Contract Bonds.

907-103.05.1--Requirement of Contract Bonds. Prior to the execution of the contract, the successful bidder shall execute and deliver to the Executive Director a performance and payment bond(s), in a sum equal to the full amount of the contract as a guaranty for complete and full performance of the contract and the protection of the claimants and the Department for materials and equipment and full payment of wages in accordance with Section 65-1-85 Miss. Code Ann. (1972 as amended). In the event of award of a joint bid, each individual, partnership, firm or corporation shall assume jointly the full obligations under the contract and the contract bond(s).

907-103.05.2--Form of Bonds. The form of bond(s) shall be that provided by or acceptable to the Department. These bonds shall be executed by a Mississippi agent or qualified nonresident agent and shall be accompanied by a certification as to authorization of the attorney-in-fact to commit the Surety company. A power of attorney exhibiting the Surety's original seal supporting the Mississippi agent or the qualified nonresident agent's signature shall be furnished with each bond. The Surety company shall be currently authorized and licensed in good standing to conduct business in the State of Mississippi with a minimum rating by A.M. Best of (A-) in the latest printing "Best's Key Rating Guide" to write individual bonds up to ten percent of the policy holders' surplus or listed on the current list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as

published by the United States Department of the Treasury, Financial Management Service, Circular 570 (latest revision as published and supplemented on the Financial Management Service Web site and in the Federal Register) within the underwriting limits listed for that Surety. All required signatures on the bond(s) and certifications shall be original signatures, in ink, and not mechanical reproductions or facsimiles. The Mississippi agent or qualified nonresident agent shall be in good standing and currently licensed by the Insurance Commissioner of the State of Mississippi to represent the Surety company(ies) executing the bonds.

Surety bonds shall continue to be acceptable to the Commission throughout the life of the Contract and shall not be canceled by the Surety without the consent of the Department. In the event the Surety fails or becomes financially insolvent, the Contractor shall file a new Bond in the amount designated by the Executive Director within thirty (30) days of such failure, insolvency, or bankruptcy. Subsequent to award of Contract, the Commission or the Department may require additional security for any supplemental agreements executed under the contract or replacement security in the event of the surety(ies) loss of the ratings required above. Suits concerning bonds shall be filed in the State of Mississippi and adjudicated under its laws without reference to conflict of laws principles.

907-103.08--Failure to Execute Contract.. In the first sentence of Subsection 103.08 on page 24, change "bond" to "performance and payment bonds".

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-104-4 **CODE: (SP)**

DATE: **03/01/2011**

SUBJECT: **Disposal of Materials**

Section 104, Scope of Work, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-104.05--Removal and Disposal of All Materials From the Project. Delete the second sentence of the first full paragraph of Subsection 104.05 on page 30 and substitute the following:

The Contractor shall also furnish the Engineer a certified letter stating that the area of disposal is not in a wetland or in Waters of the U.S.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-105-6

DATE: 03/01/2011

SUBJECT: Maintenance During Construction

After Subsection 907-105.05 on page 1, add the following.

907-105.14--Maintenance During Construction. Before the first sentence Subsection 105.14 on page 39, add the following:

The Contractor will be responsible for the maintenance of existing roadways within the limits of this project starting on the date of the Notice To Proceed / Beginning of Contract Time. Anytime work is performed in a travel lane, the Contractor shall install portable lane closure signs meeting the requirement of the MDOT Standard Drawing or MUTCD.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-105-6 **CODE: (IS)**

DATE: **01/20/2011**

SUBJECT: **Control of Work**

Section 105, Control of Work, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is modified as follows:

907-105.05--Cooperation by Contractor. In the third sentence of the second paragraph of Subsection 105.05 on page 35, change "Notice to Proceed" to "Notice of Award".

Delete the fourth paragraph of Subsection 105.05 on page 35, and substitute the following.

On projects that include erosion control pay items, the Contractor shall also designate a responsible person whose primary duty shall be to monitor and maintain the effectiveness of the erosion control plan, including NPDES permit requirements. This responsible person must be a Certified Erosion Control Person certified by an organization approved by the Department. Prior to or at the pre-construction conference, the Contractor shall designate in writing the Certified Erosion Control Person to the Project Engineer. The designated Certified Erosion Control Person shall be assigned to only one (1) project. When special conditions exist, such as two (2) adjoining projects or two (2) projects in close proximity, the Contractor may request in writing that the State Construction Engineer approve the use of one (1) Certified Erosion Control Person for both projects. The Contractor may request in writing that the Engineer authorize a substitute Certified Erosion Control Person to act in the absence of the Certified Erosion Control Person. The substitute Certified Erosion Control Person must also be certified by an organization approved by the Department. A copy of the Certified Erosion Control Person's certification must be included in the Contractor's Protection Plan as outlined in Subsection 907-107.22.1. This in no way modifies the requirements regarding the assignment and availability of the superintendent.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-107-9 **CODE: (IS)**

DATE: **01/20/2011**

SUBJECT: **Legal Relations and Responsibility to Public**

Section 107, Legal Relations and Responsibility to Public, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-107.02--Permits, Licenses and Taxes. Delete in toto Subsection 107.02 on page 49 and substitute the following:

The Contractor or any Subcontractor shall have the duty to determine any and all permits and licenses required and to procure all permits and licenses, pay all charges, fees and taxes and issue all notices necessary and incidental to the due and lawful prosecution of the work. At any time during the life of this contract, the Department may audit the Contractor's or Subcontractor's compliance with the requirements of this section.

The Contractor or any Subcontractor is advised that the "Mississippi Special Fuel Tax Law", Section 27-55-501, et seq. and the Mississippi Use Tax Law, Section 27-67-1, et seq., and their requirements and penalties, apply to any contract or subcontract for construction, reconstruction, maintenance or repairs, for contracts or subcontracts entered into with the State of Mississippi, any political subdivision of the State of Mississippi, or any Department, Agency, Institute of the State of Mississippi or any political subdivision thereof.

The Contractor or any Subcontractor will be subject to one or more audits by the Department during the life of this contract to make certain that all applicable fuel taxes, as outlined in Section 27-55-501, et seq., and any sales and/or use taxes, as outlined in Section 27-67-1, et seq. are being paid in compliance with the law. The Department will notify the Mississippi State Tax Commission of the names and addresses of any Contractors or Subcontractors.

907-107.14--Damage Claims and Insurance.

907-107.14.2--Liability Insurance. Delete Subsection 107.14.2 beginning on page 60 and substitute:

907-107.14.2.1--General. The Contractor shall carry Contractor's liability, including subcontractors and contractual, with limits not less than: $500,000 each occurrence; $1,000,000 aggregate; automobile liability - $500,000 combined single limit - each accident; Workers' Compensation and Employers' Liability - Statutory & $100,000 each accident; $100,000 each employee; $500,000 policy limit. Each policy shall be signed or countersigned by a Mississippi Agent or Qualified Nonresident Agent of the Insurance Company.

The Contractor shall have certificates furnished to the Department from the insurance companies providing the required coverage. The certificates shall be on the form furnished by the Department and will show the types and limits of coverage.

907-107.14.2.2--Railroad Protective. The following provisions are applicable to all work performed under a contract on, over or under the rights-of-way of each railroad shown on the plans.

The Contractor shall assume all liability for any and all damages to work, employees, servants, equipment and materials caused by railroad traffic.

Prior to starting any work on railroad property, the Contractor shall furnish satisfactory evidence to the Department that insurance of the forms and amounts set out herein in paragraphs (a) and (b) has been obtained. Also, the Contractor shall furnish similar evidence to the Railroad Company that insurance has been obtained in accordance with the Standard Provisions for General Liability Policies and the Railroad Protective Liability Form as published in the Code of Federal Regulations, 23 CFR 646, Subpart A. Evidence to the Railroad Company shall be in the form of a Certificate of Insurance for coverages required in paragraph (b), and the original policy of the Railroad Protective Liability Insurance for coverage required in paragraph (a).

All insurance herein specified shall be carried until the contract is satisfactorily complete as evidenced by a release of maintenance from the Department.

The Railroad Company shall be given at least 30 days notice prior to cancellation of the Railroad Protective Liability Insurance policy.

For work within the limits set out in Subsection 107.18 and this subsection, the Contractor shall provide insurance for bodily injury liability, property damage liability and physical damage to property with coverages and limits no less than shown in paragraphs (a) and (b). Bodily injury shall mean bodily injury, sickness, or disease, including death at anytime resulting therefrom. Property damage shall mean damages because of physical injury to or destruction of property, including loss of use of any property due to such injury or destruction. Physical damage shall mean direct and accidental loss of or damage to rolling stock and their contents, mechanical construction equipment or motive power equipment.

(a) **Railroad Protective Liability Insurance** shall be purchased on behalf of the Railroad Company with limits of $2,000,000 each occurrence; $6,000,000 aggregate applying separately to each annual period for lines without passenger trains. If the line carries passenger train(s), railroad protective liability insurance shall be purchased on behalf of the Railroad Company with limits of $5,000,000 each occurrence; $10,000,000 aggregate applying separately to each annual period.

Coverage shall be limited to damage suffered by the railroad on account of occurrences arising out of the work of the Contractor on or about the railroad right-of-way, independent of the railroad's general supervision or control, except as noted in paragraph 4 below.

Coverage shall include:

(1) death of or bodily injury to passengers of the railroad and employees of the railroad not covered by State workmen's compensation laws,

(2) personal property owned by or in the care, custody or control of the railroads,

(3) the Contractor, or any of the Contractor's agents or employees who suffer bodily injury or death as a result of acts of the railroad or its agents, regardless of the negligence of the railroads, and

(4) negligence of only the following classes of railroad employees:

(i) any supervisory employee of the railroad at the job site

(ii) any employee of the railroad while operating, attached to, or engaged on, work trains or other railroad equipment at the job site which are assigned exclusively to the Contractor, or

(iii) any employee of the railroad not within (i) or (ii) above who is specifically loaned or assigned to the work of the Contractor for prevention of accidents or protection or property, the cost of whose services is borne specifically by the Contractor or Governmental authority.

(b) **Regular Contractor's Liability**, including subcontractors, XCU and railroad contractual with limits of $1,000,000 each occurrence; $2,000,000 aggregate. **Automobile** with limits of $1,000,000 combined single limit any one accident; **Workers' Compensation and Employer's Liability** - statutory and $100,000 each accident; $100,000 each employee; $500,000 policy limit. **Excess/Umbrella Liability** $5,000,000 each occurrence; $5,000,000 aggregate. All coverage to be issued in the name of the Contractor shall be so written as to furnish protection to the Contractor respecting the Contractor's operations in performing work covered by the contract. Coverage shall include protection from damages arising out of bodily injury or death and damage or destruction of property which may be suffered by persons other than the Contractor's own employees.

In addition, the Contractor shall provide for and on behalf of each subcontractor by means of a separate and individual liability and property damage policy to cover like liability imposed upon the subcontractor as a result of the subcontractor's operations in the same amounts as contained above; or, in the alternative each subcontractor shall provide same.

907-107.15--Third Party Beneficiary Clause. In the first sentence of the first paragraph of Subsection 107.15 on page 61, change "create the public" to "create in the public".

907-107.17--Contractor's Responsibility for Work. Delete the fifth sentence of the fifth paragraph of Subsection 107.17 on page 63 and substitute the following:

The eligible permanent items shall be limited to traffic signal systems, changeable message signs, roadway signs and sign supports, lighting items, guard rail items, delineators, impact attenuators, median barriers, bridge railing or pavement markings. The eligible temporary items shall be limited to changeable message signs, guard rail items, or median barriers.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-107-10 **CODE: (SP)**

DATE: 03/14/2011

SUBJECT: Contractor's Erosion Control Plan

Section 107, Legal Relations and Responsibility to Public, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

Delete in toto Subsection 107.22.1 on pages 65 and 66, and substitute the following:

907-107.22.1--Contractor's Erosion Control Plan. At the preconstruction conference or prior to starting any work on the project, the Contractor shall submit to the Project Engineer for concurrence a comprehensive erosion and siltation control plan utilizing temporary measures and permanent erosion control features to provide acceptable controls during all stages of construction.

The contract time for this project has allowed 60 calendar days for the submittal and concurrence of the Contractor's erosion control plan, MDOT's review of the plan, and any revisions that may be necessary. The original contract time shall not be adjusted unless delays are caused solely by the Department for the submission, review, and concurrence of the Contractor's erosion control plan.

As a minimum, the plan shall include the following:

1. Erosion Control Plan (ECP) sheets or the plan profile sheets, 11" x 17" or larger, of all areas within the rights-of-way from the Beginning of the Project (BOP) to the End of the Project (EOP) showing the location of all temporary erosion control devices. Erosion control devices should be identified by exact type, temporary or permanent, configuration, and placement of each item to prevent erosion and siltation. A narrative of the Contractor's temporary erosion control plan shall be submitted in a format similar to the form attached to this special provision, but must include the heading and sub-heading information. As a minimum, the narrative shall include the following:
   - A detailed description, including locations (station numbers) of the Contractor's proposed sequence of operations including, but not limited to, clearing and grubbing, excavation, drainage, and structures.
   - A detailed description, including locations, and best management practices (BMP) that will be used to prevent siltation and erosion from occurring during the Contractor's proposed sequence of operations.
2. A copy of the certification for the Contractor's Certified Erosion Control Person whose primary duty shall be monitoring and maintaining the effectiveness of the erosion control plan, BMPs, and compliance with the NPDES permit requirements.
3. A plan for the disposal of waste materials on the project right-of-way which shall include but not be limited to the following:

- containment and disposal of materials resulting from the cleaning (washing out) of concrete trucks that are delivering concrete to the project site.
- containment and disposal of fuel / petroleum materials at staging areas on the project.

The erosion and siltation control plan shall be maintained on the project site at all times, updated as work progresses to show changes due to revisions in the sequences of construction operations, replacement of inadequate BMPs, and the maintenance of BMPs. Work shall not be started until an erosion control plan has been concurred with by the MDOT. The Engineer will have the authority to suspend all work and/or withhold payments for failure of the Contractor to carry out provisions of MDEQ's Storm Water Construction General Permit, the erosion control plan, updates to the erosion control plan, and /or proper maintenance of the BMPs.

907-107.22.2--Clearing and Grubbing, Haul Roads, Waste Areas, Plant Sites or Other Areas Occupied by the Contractor. Delete the fourth paragraph of Subsection 107.22.2 on page 66 and substitute the following:

Unless otherwise determined by the Engineer from a study of overall job conditions, the exposed surface area of erodible material at any one time for each of the separate operations of this subsection shall not exceed 19 acres without prior approval by the Engineer.

EXAMPLE
MISSISSIPPI DEPARTMENT OF TRANSPORTATION
Storm Water Pollution Prevention Plan (SWPPP)
Narrative

General Permit Coverage No: MSR_____
Project Number: _____
County: _____
Route: _____

SITE INFORMATION

This project consists of grading and installing drainage structures necessary to construct approximately 6 miles of parallel lanes on SR 31 between the Hinds County Line and the Rankin County Line.

SEDIMENT AND EROSION CONTROLS

VEGETATIVE CONTROLS: Clearing and grubbing areas will be minimized to comply with the buffer zones (minimum of 15 feet along the ROW lines and 5 feet along creeks) as per the contract documents. A combination of temporary and permanent grassing will be used to protect slopes as construction progresses. **Should a disturbed area be left undisturbed for 14 days or more, temporary or permanent vegetation will be placed within 7 calendar days.**

STRUCTURAL CONTROLS: Gravel construction entrance/exit will be installed near Stations 145+50, 159+50, 164+50 & 172+50. Riprap ditch checks will be constructed at Stations 144+50, 151+75, 162+00 & 166+25. The Concrete washout area will be at Stations 140+25, 152+00 & 168+50.

HOUSEKEEPING PRACTICES: Structural BPM's will be cleaned out when sediment reaches 1/3 to 1/2 of the height of the BMP. Maintenance and repair of equipment will be performed off-site, material wash out will occur either off-site or within designated wash out areas.

POST-CONSTRUCTION CONTROL MEASURES: As construction is completed, permanent vegetative growth will be established on disturbed soils to improve soil stability and provide a buffer zone for loose material. Paved ditches and flumes will be placed as specified in the ECP to reduce erosion in concentrated flow areas and rip rap will be placed as specified to dissipate flow energy and reduce flow velocity.

IMPLEMENTATION SEQUENCE

Perimeter controls will be installed first. Clearing and grubbing will be performed in 19-acre sections beginning at the BOP and temporary grassing will be installed as needed. Temporary erosion control BMP's will be installed at the drainage structures prior/during construction of the drainage structures. Grading activities will commence at the BOP and proceed towards the EOP, fill slopes will be permanently grassed in stages for fill heights that exceed 5 feet. Base materials will be installed on completed grading sections with the paving to follow.

MAINTENANCE PLAN

All erosion and sediment control practices will be checked for stability and operation following every rainfall but in no case less than once every week. Any needed repairs will be made immediately to maintain all practices as designed. Sediment basins will be cleaned out when the level of sediment reaches 2.0 feet below the top of the riser. Sediment will be removed from behind BMP's when it becomes about 1/3 to 1/2 height of BMP.

_____ _____
Prime Contractor's Signature Date

_____ _____
Printed Name Title

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-108-24 **CODE: (SP)**

DATE: 03/15/2011

SUBJECT: Prosecution and Progress

Section 108, Prosecution and Progress, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-108.01--Subletting of Contract.

907-108.01.1--General. At the end of the last paragraph of Subsection 108.01.1 on page 73, add the following:

The Engineer will have the authority to suspend the work wholly or in part and to withhold payments because of the Contractor's failure to make prompt payment within 15 calendar days as required above, or failure to submit the required OCR-484 Form, Certification of Payments to Subcontractors, which is also designed to comply with prompt payment requirements.

907-108.02--Notice To Proceed. Delete the second paragraph of Subsection 108.02 on page 75 and substitute the following:

The anticipated date of the Notice to Proceed (NTP) / Beginning of Contract Time (BCT) will be specified in the proposal.

Delete the fourth paragraph of Subsection 108.02 on page 75 and substitute the following:

Upon written request from the Contractor and if circumstances permit, the Notice to Proceed may be issued at an earlier date subject to the conditions stated therein. The Contractor shall not be entitled to any monetary damages or extension of contract time for any delay claim or claim of inefficiency occurring between the early issuance Notice To Proceed date and the Notice to Proceed date stated in the contract.

907-108.03--Prosecution and Progress. Delete Subsection 108.03.1 on pages 75 & 76, and substitute the following:

907-108.03.1--Progress Schedule. Prior to or at the Pre-Construction Conference, the Contractor shall furnish a progress schedule and be prepared to discuss both its proposed methodologies for fulfilling the scheduling requirements and its sequence of operations. The Engineer will review the schedule and approve the schedule as it relates to compliance with the specifications and logic. The progress schedule must be approved by the Engineer prior to commencing work. The schedule shall be a bar-chart type schedule submitted on 11”x17” paper meeting the below minimum requirements. These activities shall be significantly detailed enough to communicate the Contractor's understanding of the construction sequencing and phasing of the project.

When preparing the progress schedule, the Contractor shall include the following:

- Show a time scale to graphically show the completion of the work within contract time.
- Define and relate activities to the contract pay items.
- Show all activities in the order the work is to be performed including submittals, submittal reviews, fabrication and delivery.
- Show all activities that are controlling factors in the completion of the work.
- Show the time needed to perform each activity and its relationship in time to other activities.

Should the schedule not include the above requirements or becomes unrealistic during construction, the Contractor should immediately submit a revised, more realistic schedule for approval.

907-108.03.2--Preconstruction Conference. Delete the first paragraph of Subsection 108.03.2 on page 76 and substitute the following:

Prior to commencement of the work, a preconstruction conference shall be held for the purpose of discussing with the Contractor essential matters pertaining to the prosecution and satisfactory completion of the work. The Contractor will be responsible for scheduling the preconstruction conference. The Contractor will advise the Project Engineer in writing 14 days prior to the requested date that a conference is requested. When the contract requires the Contractor to have a certified erosion control person, the Contractor's certified erosion control person shall be at the preconstruction conference. The Department will arrange for utility representatives and other affected parties to be present.

Delete the third paragraph of Subsection 108.03.2 on page 76.

907-108.06--Determination and Extension of Contract Time. Delete Subsections 108.06.1 and 108.06.2 on pages 79 thru 85 and substitute the following:

907-108.06.1--Blank.

907-108.06.2--Based on Calendar Date Completion.

907-108.06.2.1--General. Contract Time will be established on the basis of a Completion Date, as indicated in the contract. The span of time allowed for the completion of the work included in the contract will be indicated in the contract documents and will be known as "Contract Time".

The span of time allowed in the contract as awarded is based on the quantities used for comparison of bids. If satisfactory fulfillment of the contract requires performance of work in greater quantities than those set forth in the proposal, the time allowed for completion shall be increased in Calendar Days in the same ratio that the cost of such added work, exclusive of the cost of work altered by Supplemental Agreement for which a time adjustment is made for such altered work in the Supplemental Agreement, bears to the total value of the original contract unless it can be established that the extra work was of such character that it required more time

than is indicated by the money value.

The Contractor shall provide sufficient materials, equipment and labor to guarantee the completion of the work in the contract in accordance with the plans and specifications within the Contract Time.

907-108.06.2.2--Contract Time. The following TABLE OF ANTICIPATED PRODUCTIVE DAYS indicates an average/anticipated number of productive days per month.

TABLE OF ANTICIPATED PRODUCTIVE DAYS

Month	Available Productive Days
January	6
February	7
March	11
April	15
May	19
June	20
July	21
August	21
September	20
October	16
November	11
December	5
Calendar Year	172

Allocation of anticipated productive days for a fractional part of the month will be computed as a proportion of the listed anticipated productive days for the applicable month.

An available productive day will be assessed (a) any day of the week, Monday through Friday, exclusive of legal holidays recognized by the Department in Subsection 108.04.1, in which the Contractor works or could have worked for more than six (6) consecutive hours on the controlling items of work, as determined by the Engineer, or (b) any Saturday, exclusive of legal holidays recognized by the Department in Subsection 108.04.1, in which the Contractor works for more than six (6) consecutive hours on the controlling items of work, as determined by the Engineer. When the Contractor works less than four consecutive hours during the day, no time will be charged for that day. When the Contractor works more than four but less than six consecutive hours, one-half (0.5) of an available work day will be charged for that day. When he Contractor works six or more consecutive hours during the day, one (1.0) available work day will be charged for that day.

Should the weather or other conditions be such that four (4) consecutive satisfactory hours are not available prior to noon (for daytime operations) or midnight (for nighttime operations), no time will be assessed for that day regardless of the above conditions. However, if the Contractor elects to work, time will be assessed in accordance with the previous paragraph.

Weather delays will not be considered for Saturdays, Sundays or legal holidays recognized by the Department in Subsection 108.04.1.

Available productive days will be based on soil and weather conditions and other specific conditions cited in the contract. The Engineer will determine on each applicable day the extent to which work in progress could have been productive, regardless of whether the Contractor actually worked.

Each month the Engineer will complete, and furnish to the Contractor, an "Assessment Report for Available Productive Days" (CSD-765). This report shows the number of available productive days during the estimate period and the cumulative available productive days to date. The Contractor should review the Engineer's report as to the accuracy of the assessment and confer with the Resident or Project Engineer to rectify any differences. Each should make a record of the differences, if any, and conclusions reached. In the event mutual agreement cannot be reached, the Contractor will be allowed a maximum of 15 calendar days following the ending date of the monthly report in question to file a protest Notice of Claim in accordance with the provisions of Subsection 105.17. Otherwise, the Engineer's assessment shall be final unless mathematical errors of assessment are subsequently found to exist, and any claim of the Contractor as to such matter shall be waived.

At any given date, the ratio of the accumulated monetary value of that part of the work actually accomplished to the total contract bid amount adjusted to reflect approved increases or decreases shall determine the "percent complete" of the work.

The "percentage of elapsed time" shall be calculated as a direct ratio of the expired calendar days to the total calendar days between the Beginning of Contract Time and the Specified Completion Date in the contract.

When the "percent complete" lags more than 20 percent behind the "percentage of elapsed time", the Contractor shall immediately submit a written statement and revised progress schedule indicating any additional equipment, labor, materials, etc. to be assigned to the work to ensure completion within the specified contract time. When the "percent complete" lags more than 40 percent behind the "percentage of elapsed time", the contract may be terminated.

907-108.06.2.3--Extension of Time. The Contractor may, prior to the expiration of the Contract Time, make a written request to the Engineer for an extension of time with a valid justification for the request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time.

No extension of the specified completion date will be granted except as provided herein. An extension of contract time may be granted for unusually severe weather, abnormal delays caused

solely by the State or other governmental authorities, or unforeseeable disastrous phenomena of nature of the magnitude of earthquakes, hurricanes, tornadoes, or flooded essential work areas which are deemed to unavoidably prevent prosecuting the work.

Unusually severe weather is defined as when the actual available productive days for the contract time are less than the number of available productive days shown in the Table of Anticipated Productive Days.

Any extension of contract time will be based on a calendar days basis, excluding Saturdays, Sundays or legal holidays recognized by the Department in Subsection 108.04.1. No proration of contract time will be made. Any extension of contract time will be made on or after the specified completion date. No extension of contract time will be made on a monthly basis.

Any revision of the specified completion date provided in the contract will be made automatically on the specified completion date as established in the contract, and at a later date if additional conditions so warrant.

If the completion of the project is extended into a season of the year in which completion of certain items of work would be prohibited or delayed because of seasonal or temperature limitations, the Engineer may waive the limitations provided the completion of the work will not result in a reduction in quality. When determined that the completion of the out-of-season items will cause a reduction in the quality of the work, the completion of the project will be further extended so the items may be completed under favorable weather conditions. In either case, the Engineer will notify the Contractor in writing.

Liquidated damages as set forth in Subsection 108.07 under the heading "Daily Charge Per Calendar Day" in the Table titled "Schedule of Deductions for Each Day of Overrun in Contract Time", shall be applicable to each calendar day after the specified completion date, or authorized extension thereof, and until all work under the contract is completed.

907-108.06.2.4--Cessation of Contract Time. When the Engineer by written notice schedules a final inspection, time will be suspended until the final inspection is conducted and for an additional 14 calendar days thereafter. If after the end of the 14-day suspension all necessary items of work have not been completed, time charges will resume. If the specified completion date had not been reached at the time the Contractor called for a final inspection, the calendar day difference between the specified completion date and the date the Contractor called for a final inspection will be added after the 14-day period before starting liquidation damages. If a project is on liquidated damages at the time a final inspection is scheduled, liquidated damages will be suspended until the final inspection is conducted and for seven (7) calendar days thereafter. If after the end of the 7-day suspension all necessary items of work have not been completed, liquidated damages will resume. When final inspection has been made by the Engineer as prescribed in Subsection 105.16 and all items of work have been completed, the daily time charge will cease.

907-108.10--Termination of Contractor's Responsibility. In the last sentence of Subsection 108.10 on page 88, change "bond" to "performance and payment bond(s)".

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-109-5 **CODE: (IS)**

DATE: 1/20/2011

SUBJECT: Measurement and Payment

Section 109, Measurement and Payment, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-109.01--Measurement of Quantities. Delete the third full paragraph of Subsection 109.01 on page 90 and substitute the following.

When requested by the Contractor, material specified to be measured by the cubic yard or ton may be converted to the other measure as appropriate. Factors for this conversion will be determined by the District Materials Engineer and agreed to by the Contractor. The conversion of the materials along with the conversion factor will be incorporated into the contract by supplemental agreement. The supplemental agreement must be executed before such method of measurement is used.

907-109.04--Extra and Force Account Work. In the last sentence of subparagraph (b) in Subsection 109.04 on page 91, change “bond” to “bond(s)”.

Delete the first sentence of the second paragraph of subparagraph (d) in Subsection 109.04 on page 92 and substitute the following:

In the event an agreement cannot be reached for a particular piece of equipment, the book entitled "Rental Rate Blue Book For Construction Equipment" as published by EquipmentWatch® and is current at the time the force account work is authorized will be used to determine equipment ownership and operating expense rates.

907-109.06--Partial Payment.

907-109.06.1--General. Delete the fourth and fifth sentences of the third paragraph of Subsection 109.06.1 on page 94, and substitute the following:

In the event mutual agreement cannot be reached, the Contractor will be allowed a maximum of 25 calendar days following the Contractor’s receipt of the monthly estimate in question to file in writing, a protest Notice of Claim in accordance with the provisions Subsection 105.17. Otherwise, the Engineer's estimated quantities shall be considered acceptable pending any changes made during the checking of final quantities.

907-109.07--Changes in Material Costs. Delete the third full paragraph of Subsection 109.07 on page 96 and substitute the following:

A link to the established base prices for bituminous products and fuels will be included in the contract documents under a Notice to Bidders entitled "Petroleum Products Base Prices."

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-230-2 **CODE: (SP)**

DATE: 06/01/2004

SUBJECT: Tree, Annual, Shrub and Groundcover Planting

Section 907-230, Tree and Shrub Planting, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as amended by this special provision is applicable to Tree, Annuals, Shrub and Groundcover Planting Only.

907-230.01--Description. The work covered under this special provision consists of furnishing all labor, materials, tools, tests, royalties, services and other incidentals as may be required for the good and proper completion of the tree, annual, shrub and groundcover planting operations.

The extent of planting locations are shown on the plans.

The Contractor is responsible for notes on the plans which call attention to particular requirements or conditions. The fact that these requirements or conditions are not called out in the specifications does not relieve the Contractor of responsibility for these requirements or conditions.

907-230.01.1--Maintenance of Site During Planting. Sidewalks, roads and other paving adjacent to planting operations shall be kept clean and free of obstruction, mud and debris at all times. Wheels of vehicles used in the work shall be cleaned if necessary. Sidewalks shall be protected from damage and markings from wheels of vehicles used in the work.

Flushing of streets and disposal of dirt or debris into sewers or drainage ditches will not be permitted.

Dust shall be controlled by approved means to the satisfaction of the Engineer.

907-230.01.2--Quality Assurance. At least one person thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation shall be present at all times during execution of this work and shall direct all work being performed.

All workers shall have sufficient skill and experience to properly perform the work assigned to them. Workers engaged in special work or skilled work shall have the sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactory.

The selection of all materials and execution of all preparations required under the plans and specifications shall be subject to the approval of the Engineer. The Engineer shall have the right to reject any and all materials, any and all work, which in the opinion of the Engineer does not meet with the requirements of the specifications at any stage of the operations. All rejected materials shall be removed from the site at no additional cost to the State. Rejected work shall be replaced with work of the specified quality or corrected as directed by the Engineer at no additional cost to the State.

All plants and their installation materials, shall meet or exceed the specifications of Federal, State, and County laws requiring inspection for plant disease and insect control.

Quality and size shall conform with the current edition of "Horticulture Standards" for number one grade nursery stock as adopted by the American Association of Nurserymen.

All plants shall be true to name. Each tree or planting lot shall be tagged with the name and size of the plants in accordance with the standards of practice of the American Association of Nurserymen. In all cases, botanical names shall take precedence over common names.

Plant nomenclature shall conform to Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada by MacMillan Publishing Company, Inc., New York.

907-230.01.3--Replacements of Plants. The Contractor shall make periodic inspections during the life of the project to determine what changes, if any, should be made in the City of Ridgeland's maintenance program. All such recommended changes shall be submitted, in writing, to the Engineer.

The Contractor shall replace, at no additional cost to the State, and as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition, as determined by the Engineer. The plants shall be free of dead branches and dead branch tips, and shall bear foliage of a normal density, size and color. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification.

The Contractor shall make all necessary repairs to grades, mulch or plant materials required because of plant replacements. Such repairs shall be done at no additional cost to the State.

907-230.02--Materials.

907-230.02.1--Soil Mix. Soil mix within all groundcover and annual planting beds shall be furnished at a 24-inch depth. Shrub planting pits shall be backfilled with soil mix as specified on the shrub planting drawing details. Soil mix furnished for all plant materials shall be fertile, friable, sandy loam soil mix complying with the following quantitative analysis:

1. Decomposed organic matter ..... 5 to 8%
2. Silt ..... 10 to 30%
3. Sand ..... 25 to 75%
4. Clay ..... 5 to 10%
5. pH ..... 5.0 to 6.5

Soil mix shall not contain any substance or material inhibitory to plant growth, and shall be without admixture of clay, hardpan, mulch, marl, shale or other material which in the opinion of the Engineer shall render it unsuitable for use. Soil mix shall also be free of stones, lumps, noxious weeds or their seeds, grasses or their seeds, other plants or their roots, branches, sticks, or other extraneous material larger than two inches in diameter. Soil mix found to contain any of the above-listed items shall be

chemically or mechanically treated, or removed from the project at the discretion of the Engineer.

The Contractor shall be required to have tests run on the soil mix proposed for use, to determine the soil mix's compliance with the above-listed quantitative analysis. In addition to the above tests, the Contractor shall be required to have tests run for soluble salt, nitrogen, phosphorus, potassium, calcium, and magnesium content, for percent organic matter, and pH. These soil tests shall be conducted by a soils testing laboratory approved by the Engineer.

Following initial soil testing and approval of soil mix for use, soil mixes placed on the project may be sampled and tested as specified above at random, as directed by the Engineer, at no additional cost to the State.

Additions of fertilizer and/or lime to the soil mix furnished, as may be recommended by the Soil Test Report issued by the soil testing laboratory, shall be done by the Contractor as part of the work. No additions of fertilizer, lime, conditioning, or placement of soil mix shall be done prior to furnishing, in writing to the Engineer, all initial soil test results and obtaining his approval of soil mixes tested.

907-230.02.1.1--Fertilizer. Fertilizer shall be a commercially available material conforming to Mississippi Fertilizer Laws. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it, in the opinion of the Engineer, unsuitable for use, will not be accepted. Commercial balanced fertilizer of analysis 13-13-13 shall be provided for use in soil mixture conditioning.

907-230.02.1.2--Lime. Lime shall be crushed or ground so that 90 percent passes a 10-mesh screen and not less than 50 percent will pass a 60-mesh screen. All lime shall have a neutralizing value of 90 percent calcium carbonate or better. Lime which has become caked or otherwise damaged, making it, in the opinion of the Engineer, unsuitable for use, will not be accepted.

Lime shall be applied at the rate specified by the soil test reports.

907-230.02.1.3--Water. Potable water, furnished by the Contractor, shall be supplied to the plants in adequate quantities to insure their healthy survivability until final acceptance of the project. The Contractor shall make whatever arrangements may be necessary to insure an adequate supply of water. The Contractor shall also furnish all necessary hose, equipment, attachments and accessories as may be necessary to complete the work.

907-230.02.1.4--Organic Matter. Klumb's, or approved equal, decomposed pine bark soil conditioner shall be provided for use in planting soil mix.

907-230.02.1.5--Sand. Clean sharp builder's sand shall be provided for use in planting soil mix.

907-230.02.2—Plant Materials.

907-230.02.2.1--General. All plants as indicated on the plans and/or listed in the plant schedule shall

be provided. Unless otherwise specifically permitted, plants shall be nursery-grown in accordance with the best modern horticultural practices.

Plants shall comply with State and Federal laws relating to inspection for diseases and insect infestation. Inspection certificates shall be filed with the State.

Substitutions of other plants shall not be permitted unless authorized in writing by the Engineer. If proof is submitted that any plant size specified is unobtainable, a proposal will be considered for use of the nearest equivalent size or variety.

Durable, legible labels stating the correct plant name and size specified in the Plant Schedule shall be securely attached to each plant or plant container delivered to the planting site for the purpose of inspection and plant identification.

907-230.02.2.2--Quality and Inspection. Plants shall conform to the requirements set forth in ANSI 260.1 Standard for Nursery Stock and shall be of standard quality, true to name and type and first-class representatives of their species and variety. Balled & Burlapped (B&B) materials shall have been root pruned within the last two years. Container grown plants shall have been grown in the delivery container for one growing season.

Plants shall have normal, well-developed branches and vigorous fibrous root systems. They shall be healthy, vigorous plants free from defects, decay, disfiguring roots, sun-scald injuries, abrasions of the bark, diseases, insect pests or their eggs, borers and any other form of infestation or objectionable disfigurements.

Plants lacking density or proper proportions, plants which are weak or thin, plants which have a damaged or crooked leader or multiple leaders unless specifically specified, or plants injured by too close planting in nursery rows will be rejected. Plant materials which have been cut back from larger grades to meet certain requirements will not be accepted. Plants shall not be pruned prior to delivery to the point of planting.

All plants shall be subject to inspection and approval by the Engineer at any place and at any time. Portions or parts of plants required for the work may be inspected at the place of growth, but inspection at the place of growth shall not in any way impair the right of rejection at the site.

907-230.02.2.3--Measurements. Trees shall be measured when branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from tip to tip. Caliper measurements shall be taken at a point on the tree trunk six inches above natural ground line for trees up to four inches in caliper. Caliper measurements for trees specified as greater than four inches in caliper shall be taken at a point on the trunk 12 inches above the natural ground line.

Shrubs and groundcover shall be measured by container size; however, additional dimensions are often given within the plant material schedule on the plans to verify that the container size is accurate for the spread & height of the plant, per the American Association of Nurserymen (AAN). These

measurements are taken when branches are in the plant's normal position. Height and spread dimensions specified refer to the main body of the plant and not from tip to tip.

Annuals shall be measured by container size.

If a range of size is given, no plant shall be less than the minimum size and not less than 50% of the plants shall be as large as the maximum size acceptable and/or the measurements after pruning, where pruning is necessary.

Plants that meet the measurements specified, but do not possess a normal balance between height and spread, shall be rejected.

Plants larger than those specified and of equal quality to those specified may be accepted at no additional cost to the State.

907-230.02.2.4--Balled & Burlapped (B&B) Trees. Trees designated "B&B" in the Plant Schedule shall be adequately balled with firm, natural balls of soil in sizes as set forth in ANSI 260.1 Standard for Nursery Stock. Balls shall be firmly wrapped with jute burlap weighing not less than 7.2 ounces per square yard or other approved strong cloth of equal strength and resistance to tearing and laced with a suitable heavy jute twine. No B&B tree shall be planted if the root ball is cracked or broken before or during the process of planting or if the tree is loose in the root ball.

907-230.02.2.5--Container Grown Plants. Plants designated "container-grown" in the Plant Schedule shall be furnished in sound containers of the size specified. The plant materials contained therein shall conform to the requirements set forth in ANSI 260.1 Standard for Nursery Stock for container-grown plants. No container-grown plant shall be planted if the root and soil mass is cracked or broken either before or during the process of planting. Root bound container-grown stock will not be accepted. Containers shall be free of weeds and grasses. Containers found to contain objectionable weeds and/or grasses will be rejected.

907-230.02.2.6--Delivery, Handling and Temporary Storage. Trees designated "B&B" shall be freshly dug at the time of delivery. All trees shall be dug and/or handled with skill and care so as to prevent injuries to the trunk, branches and roots and shall be packed in an approved manner to ensure arrival at the project site in good condition.

Plants shall not be bound with wire or rope at any time in such a manner that injury to the plant results. Plants shall be handled and lifted from the bottom of the root ball, using whatever means is necessary.

Protective covering shall be provided for the plants during delivery and while in storage awaiting planting.

Until planted, all plants shall be protected from excessive moisture loss and/or freezing by covering the root balls or containers with sawdust or other approved mulch material. Adequate water shall be provided to all plants while in storage and awaiting planting.

907-230.02.2.7--Pine Bark Mulch. A three (3) inch depth layer of clean pine bark mulch, free of weed seeds, moss, stones, sticks, cones, or other debris shall be provided within the planting saucer of each tree. Pine bark mulch shall not contain materials or toxic substances which may adversely influence growth.

907-230.02.2.8--Antitranspirant. "Wilt-proof" antitranspirant or other approved wilt-proofing agent shall be provided for all trees in leaf.

907-230.02.2.9--Staking And Guying. Materials for staking and guying of trees shall be as called for by the planting details.

The Contractor will be responsible for removal of all tree guy wires. It will be up to the Contractor to determine when to remove guy wires to prevent girdling to tree trunks. The Contractor will re-guy trees if the tree is not yet mature enough to support its own weight, or not enough root growth has occurred to anchor it firmly. If damage occurs to trees from girdling of the trunks, or removal of guy wires too early, the Contractor will replace all such material at no additional cost to the State.

907-230.03--Construction Requirements.

907-230.03.1--Site Preparation. All construction debris shall be removed from the subgrade surface before beginning landscape operations. Subgrade shall be free of all brick, concrete, mortar, gravel, asphalt, lumber, sheetrock, and any other materials which would adversely influence plant growth.

907-230.03.2--Installation. The locations of all trees shall be staked and approval of the Engineer obtained before planting begins. The Engineer may adjust the locations of tree prior to planting.

Prior to planting, fluorescent marking paint shall be used to lay out each of the plant beds for location approval by the Engineer. The plant material in their original containers shall be positioned within the painted bed locations, for approval as well. The Engineer may adjust the locations of the plants prior to planting.

Existing site conditions shall be examined before work begins. The Contractor shall notify the Engineer of any unsatisfactory conditions. No work shall be performed until such conditions are satisfactory and acceptable.

Prior to planting, the Engineer shall be informed in writing of existing conditions which could be detrimental to the successful planting and subsequent growth and health of the plants, including but not limited to: subsurface drainage conditions, underground utility locations, and other subgrade conditions.

All plant pits shall be circular in outline. All excavations shall have vertical sides. The depths and widths shall be as specified on planting details.

907-230.03.3--Setting Plants. Trees shall be uniformly set two to four inches (2" to 4") higher than

the surrounding grade or as necessary to provide adequate drainage away from the roots.

Annuals, shrubs and groundcover, as specified in the appropriate planting detail, shall be set to insure the plant material is high enough to promote positive water drainage away from the roots.

Planting areas and pits shall be prepared as specified and as shown on the plans, prior to inserting plants. Specified soil mixture shall be used to backfill beds and pits. When tree pits have been backfilled approximately 2/3 full, water shall be thoroughly incorporated before installing remainder of soil mix to top of pit.

Plants shall be set plumb and braced rigidly in position until the soil mix has been tamped solidly around the root ball.

Rope or strings shall be cut from the top of the root ball after the tree has been set. Burlap or cloth wrapping shall be left intact around balls. Portions of the burlap exposed at the top of root ball shall be turned under and buried.

Shallow saucers capable of holding water about each tree shall be formed by placing a mound of soil mix around the edge of each filled-in pit.

All plants shall be thoroughly watered by hose immediately after planting.

Tree saucers and bed areas shall be uniformly mulched with a three (3) inch layer of pine bark mulch.

Trees over two inches in caliper shall be guyed with a minimum of three guy wires spaced evenly around the tree. Each guy wire shall be attached to the tree with a single loop through a hose with an angle of 60 degrees to the tree trunk. The guy wire shall be attached in accordance with planting details. Guy wires shall be kept taut. Removal of guy wires will be the responsibility of the Contractor.

All trees shall be pruned, as necessary, at the site in accordance with standard modern horticultural practice as approved by the Engineer. Cuts over two inches in diameter shall be painted with flat black oil based enamel paint. Pruning shall be done with clean, sharp tools.

907-230.03.4--Site Maintenance. Excess and waste materials shall be continuously and promptly removed and disposed of as specified herein and all reasonable precaution taken to avoid damage to existing structures.

When all work has been completed in an area, the area shall be cleaned up to the satisfaction of the Engineer. Debris, rubbish, subsoil, soil mix and other waste material shall be cleaned up and removed from the project site.

907-230.03.5--Protection Of The Work And The Public. The Contractor shall take all necessary precautions to adequately protect the work under construction from damage by the public and to protect the public from accident and unnecessary inconvenience.

In the event that pavement, structures, walls, sidewalks, curbs, substructures, or utilities are disturbed or damaged by the Contractor during execution of the work, the Contractor shall make repairs, at no additional cost to the State. If the damaged item is owned or operated by one of the several public utilities, repair shall be accomplished as directed by the utility. If the damaged item is the property of the State, repair shall be made in a manner acceptable to the Engineer.

907-230.03.6--Landscape Maintenance. Maintenance shall begin immediately after each plant is planted.

Maintenance of new plants shall consist of pruning, trimming, watering, cultivating, weeding, mulching, resetting to proper grades or upright position, restoration of the planting saucer, litter removal from bed areas and furnishing and applying such sprays as are necessary to keep the plants free of insects and diseases. This will be required until final acceptance of the work.

Planting areas and plants shall be protected at all times against trespassing damage of any kind for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Engineer at no additional cost to the State. No work shall be done within, adjacent to, or over any planting area without proper safeguards and protection to the plant.

The Contractor shall be responsible for keeping all plants and work incidental thereto, in good condition by planting replacements, watering, weeding, pruning and spraying, and by performing all other necessary operations of care for promotion of root growth and plant life, so that all work is in a satisfactory condition at the final inspection of the project.

All leaves, litter, gravel, or other debris shall be removed from all landscaped areas at weekly intervals until final acceptance. Such materials shall be collected and properly disposed of off the project site.

The root system of all plants shall be watered at such intervals as will keep the surrounding soil in the best condition for promotion of root growth and the overall healthy life of the plant.

907-230.3.7--Inspection And Final Acceptance. After the completion of all items of work, and upon written request of the Contractor, the Engineer will inspect all work for final acceptance. Upon completion of any deficiencies, the Engineer will certify in writing as to the final acceptance of the project. The Contractor's responsibility for maintenance will terminate the day after final acceptance of the work.

907-230.04--Method of Measurement. Tree planting, annual planting, shrub and groundcover planting, complete and accepted, will be measured per each as indicated on the plans and in the bid schedule of the contract.

907-230.05--Basis of Payment. Tree planting, annual planting, shrub and groundcover planting, measured as prescribed above, will be paid for at the contract unit price bid per each, which price shall be full compensation for furnishing all planting soil mix, soil lab testing and reports, fertilizer, lime, herbicide treatment, nursery tagging and associated trips, tree staking and guying, mulches,

watering, plant material, labor and equipment, storing and protection and incidentals necessary to complete the work.

Payment will be made under:

907-230-A:	Tree Planting, Description	- per each
907-230-F:	Shrub and Groundcover Planting, Description	- per each
907-230-G:	Annuals Planting, Description	- per each

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-234-5 **CODE: (SP)**

DATE: **09/23/2010**

SUBJECT: **Siltation Barriers**

Section 234, Silt Fence, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

907-234.01--Description. Delete the first paragraph of Subsection 234.01 on page 177 and substitute the following:

This work consists of furnishing, constructing and maintaining a water permeable filter type fence, inlet siltation guard or turbidity barrier for the purpose of removing suspended soil particles from the water passing through it in accordance with the requirements shown on the plans, directed by the Engineer and these specifications. Fence, inlet siltation guards and turbidity barriers measured and paid as temporary shall be removed when no longer needed or permanent devices are installed.

Delete the first sentence of the second paragraph of Subsection 234.01 on page 177 and substitute the following:

It is understood that measurement and payment for silt fence, inlet siltation guards, and turbidity barriers will be made when a pay item is included in the proposal.

907-234.02--Materials. After the first paragraph of Subsection 234.02 on page 177, add the following:

Inlet siltation guards shall be listed on the Department's "Approved Sources of Materials".

Turbidity barriers shall be one of the following, or an approved equal.

1. SiltMax Turbidity Barrier by Dawg, Inc., 1-800-935-3294, www.dawginc.com
2. Turbidity Barrier by IWT Cargo-Guard, Inc., 1-609-971-8810, www.iwtcargoguard.com
3. Turbidity Curtain by Abasco, LLC, 1-281-214-0300, www.abasco.net

Chain link fence and hardware for super silt fence shall meet the requirements of Section 607, as applicable. Geotextile for super silt fence shall meet the requirements of Subsection 714.13 for a Type II Woven fabric.

907-234.03--Construction Requirements. After the last paragraph of Subsection 234.03.1 on page 178, add the following:

Super Silt Fence. Super silt fence shall be constructed in accordance with the plans and these specifications.

All posts shall be installed/driven so that at least 34 inches of the post will protrude above the ground. The chain link wire and geotextile shall be stretched taut and securely fastened to the posts as shown on the plans. The bottom edge of the fence and geotextile shall be buried at least eight inches below ground surface to prevent undermining. When splicing of the geotextile is necessary, the fabric shall be overlapped approximately 18 inches.

907-234.03.1.1--Placement of Inlet Siltation Guards and Turbidity Barriers. The inlet siltation guards and turbidity barriers shall be constructed at the locations shown on the erosion control plans. Inlet siltation guards and turbidity barriers shall be installed in accordance with the erosion control drawings in the plans. A copy of the manufacturer's instructions for placement of inlet siltation guards and turbidity barriers shall be provided to the Engineer prior to construction.

907-234.03.2--Maintenance and Removal. At the end of the first paragraph of Subsection 234.03.2 on page 178, add the following:

The Contractor shall maintain the inlet siltation guards. The geotextile shall be removed and replaced when deteriorated to such extent that it reduces the effectiveness of the guard. Replacement geotextile shall be the same type and manufacture as the original. Excessive accumulations against the guard shall be removed and disposed of at a location approved by the Engineer.

The Contractor shall maintain the turbidity barriers. Excessive accumulations against the turbidity barrier shall be removed and disposed of at a location approved by the Engineer.

Delete the second paragraph of Subsection 234.03.2 on page 178 and substitute the following:

Unless otherwise directed, all temporary silt fences, inlet guards and turbidity barriers shall be removed. Upon removal, the Contractor shall remove and dispose of any excess silt accumulations, shape the area to the line, grade, and cross section shown on the plans and vegetate all bare areas in accordance with the contract requirements. The temporary fence, inlet guard materials and turbidity barriers will remain the property of the Contractor and may be used at other locations provided the materials are acceptable to the Engineer.

After Subsection 234.03.2 on page 178, insert the following:

907-234.03.3--Resetting Inlet Siltation Guards and Turbidity Barriers. When inlet siltation guards and turbidity barriers are no longer needed at one location, they may be removed and reset at other needed locations. The Engineer may allow the resetting of siltation guards and turbidity barriers upon an inspection and determination that the siltation guards (frame and geotextile) and turbidity barriers are adequate for their intended purpose. When they have to be stored until needed at another location, payment for resetting will not be made until they are reset at their needed location.

907-234.04--Method of Measurement. Delete the sentence in Subsection 234.04 on page 178, add the following:

Silt fence and super silt fence will be measured by the linear foot.

Inlet siltation guard and resetting siltation guards will be measured per each. Turbidity barrier will be measured per linear foot.

907-234.05--Basis of Payment. Delete the sentence in Subsection 234.05 on page 178, add the following:

Silt fence and super silt fence, measured as prescribed above, will be paid for at the contract unit price per linear foot which shall be full compensation for completing the work.

Inlet siltation guard, resetting inlet siltation guards, and turbidity barrier, measured as prescribed above, will be paid for at the contract unit price per each or linear foot, which shall be full compensation for furnishing, constructing, and maintaining the work and for the removal and disposal of all items comprising the devices.

After the last pay item listed on page 178, add the following:

907-234-C:	Super Silt Fence	- per linear foot
907-234-D:	Inlet Siltation Guard	- per each
907-234-E:	Reset Inlet Siltation Guard	- per each
907-234-F:	Turbidity Barrier	- per linear foot

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-237-3 **CODE: (SP)**

DATE: 01/14/2010

SUBJECT: Wattles

Section 907-237, Wattles, is hereby added to and made a part of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as follows.

SECTION 907-237 - WATTLES

907-237.01--Description. This work consists of furnishing, constructing and maintaining wattles for the retention of soil around inlets, swale areas, small ditches, sediment basins and other areas as necessary. Also, the work includes removing and disposing of the wattles and silt accumulations.

Measurement and payment for wattles will be made only when a pay item is included in the bid schedule of the proposal. The quantity is estimated for bidding purposes only and will be dependent upon actual conditions which occur during construction of the project.

907-237.02--Materials. Wattles used around inlets shall have a minimum diameter of twelve inches (12") and a length adequate to meet field conditions. Wattles used at other locations shall have a minimum diameter of twenty inches (20") and a length adequate to meet field conditions. The stakes used in securing the wattles in place shall be placed approximately three feet (3') apart throughout the length of the wattle. Stakes shall be wooden and of adequate size to stabilize the wattles to the satisfaction of the Engineer.

In addition to the requirements of this specifications, wattles shall be listed on the Department's "Approved Sources of Materials".

907-237.03--Construction Requirements.

907-237.03.1--General. The wattles shall be constructed at the locations and according to the requirements shown on the erosion control plan.

907-237.03.2--Maintenance and Removal. The Contractor shall maintain the wattles and remove and dispose of silt accumulations.

When the wattles are no longer needed, they shall be removed and the Contractor shall dispose of silt accumulations and treat the disturbed areas in accordance with the contract requirements.

907-237.04--Method of Measurement. Wattles of the size specified will be measured per linear foot.

907-237.05--Basis of Payment. Wattles, measured as prescribed above, will be paid for at the contract unit price per linear foot, which price shall be full compensation for installation, maintaining and removal of the wattles, the removal and disposal of silt accumulations and any required restoration of the disturbed areas.

Payment will be made under:

907-237-A: Wattles, Size - per linear foot

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-242-25 **CODE: (SP)**

DATE: **03/30/2011**

SUBJECT: **Shop Building for Materials Laboratory**

PROJECT: **BWO-9718-25(001)/502350301 & LWO-9023-25(002)/502350302 -- Hinds County**

Section 907-242, Shop Building for Materials Laboratory, is hereby added to and made part of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as follows:

SECTION 907-242-- SHOP BUILDING FOR MATERIALS LABORATORY

The following specifications are to be used ONLY for the Shop Building for Materials Laboratory. Measurement and payment will be lump sum under pay item 907-242-A.

The Mississippi Standard Specifications for Road and Bridge Construction shall be used for all items of work other than the building construction..

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MISSISSIPPI DEPARTMENT OF TRANSPORTATION

PROJECT: **SHOP BUIDING FOR MATERIALS LABORATORY JACKSON, HINDS COUNTY, MISSISSIPPI**

PROJECT NUMBER: **BWO-9718-25(001) 502350**
LWO-9023-25(002) 502350

DATE: **March 28, 2011**

DESCRIPTION A: This Work shall consist of all construction work necessary in constructing the Shop Building for Materials Laboratory in Jackson, Hinds County, Mississippi, in accordance with these Specifications and conforming with the Drawings.

It is the intention of these Specifications to provide the necessary items and instruction for a complete building including all code compliance. Omission of items or instruction necessary or considered standard good practice for the proper installation and construction of the building shall not relieve the Contractor of furnishing and installing such items and conforming to the building codes having jurisdiction.

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SECTION 00 21 13 INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 QUESTIONS

A. General questions should be directed to the Project Architect. Should a Bidder find Discrepancies in or omissions from the Drawings or Project Manual, or be in doubt as to their meaning, the Bidder should immediately notify the Project Architect. The Contract Administration Architect will send the Project Architect's written instruction(s) or interpretation(s) to all known holders of the Documents. Neither the Owner, nor the Project Architect, will be responsible for any oral instruction or interpretation.

1.02 BIDDER'S QUALIFICATIONS

A. Certificate of Responsibility: The Mississippi State Board of Contractors is responsible for Issuing Certificates of Responsibility to Contractors. To be awarded a Contract for public work, Sections 31-3-15 and 31-3-21 of the Mississippi Code 1972, Annotated requires a Contractor to have a current Certificate of Responsibility at bid time and during the entire length of the job. The Certificate of Responsibility number issued becomes a significant item in all public bidding.

B. Bid Under $50,000: If a Bidder submits a bid not exceeding $50,000, no Certificate of Responsibility number is required; however, a notation stating the bid does not exceed $50,000 must appear on the face of the envelope, or a Certificate of Responsibility number.

C. Bid Over $50,000: Each Bidder submitting a bid in excess of $50,000 must show its Certificate of Responsibility number on the bid and on the face of the envelope containing the bid.

D. As a condition for awarding of a bid, the total amount of which is equal to or excess of $50,000 and financed 100% with State funds, the bidder must have a current Certificate of Responsibility to do Building Construction issued by the Mississippi State Board of Public Contractors or a similar certificate issued by another state recognizing such certificate issued by the State of Mississippi.

E. Joint Venture Bid: When multiple Contractors submit a joint venture bid in excess of $50,000, a joint venture Certificate of Responsibility number must be shown on the bid and on the face of the envelope containing the bid. If the Multiple-Contractor joint venture has no joint venture Certificate of Responsibility number, each of the Contractors participating in the bid must indicate their individual Certificate of Responsibility numbers on the bid and on the face of the envelope.

1.03 NON-RESIDENT BIDDER

A. When a non-resident Bidder (a Contractor whose principal place of Business is outside the State of Mississippi) submits a bid for a Mississippi public works project, one of the following is required and shall be submitted with the Proposal Form:

B. Copy of Law: If the non-resident Bidder's state has a resident Bidder preference law, a copy of that law shall be submitted with the Proposal Form.

C. Statement: If the state has no such law then a statement indicating the State of (Name of State) has no resident Contractor preference law shall be submitted with the Proposal Form.

1.04 DISQUALIFICATION OF BIDDER

A. A Bidder may be disqualified for having defaulted on a previous Contract.

1.05 CONDITIONS OF WORK

A. Each Bidder must fully inform himself of all conditions relating to the construction of the Project and employment of labor thereon. Failure to do so will not relieve a successful Bidder of obligations to furnish all material and labor necessary to carry out the provisions of the Contract. Insofar as possible, the Bidder must employ methods, or means, which will not cause interruption of, or interference with, the work of any other Bidder or Contractor.

1.06 EXAMINATION OF SITE

A. All Bidders, including the general Contractor and Subcontractors shall visit the building site, compare the Drawings and Project Manual with any work in place and informed of all conditions. Failure to visit the site will in no way relieve the successful Bidder from furnishing any materials or performing any work required to complete Work in accordance with Drawings and Project Manual (Proposal) without additional cost to the Owner.

1.07 LAWS AND REGULATIONS

A. The Bidder's attention is directed to the fact that all applicable Mississippi state laws, rules and regulations of all authorities having jurisdiction over construction of the Project apply to the Contract.

1.08 OBLIGATION OF BIDDER

A. At the bid opening, each Bidder will be presumed to have inspected the site, read and become thoroughly familiar with the Drawings and the Project Manual (Proposal) including all addenda.

1.09 BID DOCUMENT

A. The amount for Bid Document (Proposal) is indicated in the advertisement for Bids. Selected plan rooms will be issued one set of documents without charge.

1.10 METHOD OF BIDDING

A. Lump sum, single bids received on a general contract will include general, mechanical and electrical construction and all work shown on Drawings or specified in the Project Manual (Proposal).

1.11 PROPOSAL FORMS

A. The Bidder shall make all proposals on forms provided and shall fill all applicable blank spaces without interlineation or alteration and must not contain recapitulation of the work to be done. No oral or telegraphic proposals will be considered.

1.12 TIME OF COMPLETION

A. The Bidder shall agree to commence work on, or before a date specified in a written *NOTICE TO PROCEED* and fully complete the Project within the calendar days indicated on the Proposal Form.

1.13 SUBSTITUTIONS

A. No substitutions, qualifications or redefining of the Specification requirements are allowed to be marked on the Proposal Form, unless specifically required by the Bid Documents. Refer to Section 01 62 15 entitled *Product Options and Substitution Procedures* which covers procedures after the award of Contract.

1.14 ADDENDA

A. Any addenda to the Drawings or Project Manual issued before or during the time of bidding shall be included in the proposal and become a part of the Contract

1.15 BIDDER IDENTIFICATION

A. Signature: The Proposal Form shall be signed, by any individual authorized to enter into a binding agreement for the Business making the bid proposal.

B. Name of Business: The name appearing on the Proposal Form should be the same as the name appearing in the current Mississippi State Board of Contractors Roster.

C. Legal Address: The address appearing on the Proposal Form should be the same address appearing in the current Mississippi State Board of Contractors Roster.

D. Certificate of Responsibility Number(s): The Certificate of Responsibility Number(s) appearing on the Proposal Form should be the same number appearing in the current Mississippi State Board of Contractors Roster.

1.16 BID SECURITY

A. The Bid Security shall be in the form of a Bid Bond, or a Certified Check:

1. Bid Bond: The Bidder may submit a Bid Bond made out to the STATE OF MISSISSIPPI by a Surety licensed in Mississippi in the amount of five percent (5%) of the base bid. The Bidder, the Surety and a Mississippi Agent or Qualified Non-Resident Agent, with Power of Attorney attached or on file with the Contract Administration Engineer, shall duly execute the Bid Bond. The Project number shall be identified on the Bid Bond. (No standard form is required for the Bid Bond.)
2. Certified Check: The Bidder may submit a certified check made out to the STATE OF MISSISSIPPI in the amount of five percent (5%) of the base bid. The Project number shall be identified on the Certified check. All checks received from Bidders will be returned upon request, unless a Bidder is one (1) of the three (3) apparent low Bidders. The three (3) apparent low Bidder's checks will be held for forty-five (45) days, unless a Contract is awarded and executed in less time.

1.17 POWER OF ATTORNEY

A. Each bid security must be accompanied by an appropriate Power of attorney.

1.18 SUBMITTAL

A. This Proposal, which includes the Bid Forms and Specifications, must have all applicable parts completely filled out and delivered in its entirety to the address indicated on the Advertisement for Bids prior to the time and date stated.

B. DO NOT remove any part of the Contract Documents (Exception – An addendum requires substitution of second sheet of Section 905 (*Proposal Forms*).

C. Failure to complete all of the applicable requirements may be cause for the Proposal to be considered irregular.

D. A STRIPPED PROPOSAL THAT IS NOT RE-ASSEMBLED IN ITS CORRECT ORDER IS CONSIDERED AS AN IRREGULAR BID AND WILL BE REJECTED.

E. The Proposal shall be submitted and sealed in the opaque envelope provided and mailed or hand-delivered.

1. If the Bid is mailed, the bid envelope shall be placed inside a second envelope to prevent inadvertent premature opening of the Proposal. The second mailing envelope shall have the notations “SEALED BID ENCLOSED” on the face thereof.

1.19 MODIFICATION TO BID

A. A Bidder may **not** modify the bid prior to the scheduled closing time indicated in the Advertisement for Bids in the following manner:

1. Notification on Envelope: A modification may NOT be written on the outside of the sealed envelope containing the bid.
2. Facsimile: A facsimile (fax) will NOT be acceptable.

1.20 WITHDRAWAL OF BID

A. Any bid may be withdrawn prior to the scheduled time for opening of bids. However, bids may not be withdrawn until sixty (60) days after bid opening.

1.21 OPENING OF BIDS

A. Bids will be publicly opened shortly after the time stated in the advertisement for Bids. Bidder representatives are invited; however, attendance is not mandatory.

1.22 IRREGULARITIES

A. The omission of any information requested on the Proposal Form may be considered as an informality, or irregularity, by the awarding public body when in their opinion the omitted information does not alter the amounts contained in the submitted bid proposal, or place other Bidders at a disadvantage.

1.23 PROTEST

A. Any protest must be delivered in writing to the Owner within twenty-four (24) hours after the bid opening.

1.24 ERRORS

A. Any claim of error and request for release from bid must be delivered in writing to the Owner within twenty-four (24) hours after the bid opening. The Bidder shall provide sufficient documentation with the written request clearly proving an error was made.

1.25 AWARD OF CONTRACT

A. The Owner reserves the right to reject any, or all bids. A Contract will be awarded on the basis of the low base bid, or low combination of base bid and those alternates selected by the Owner in any order determined to be in the best interest of the Mississippi Transportation Commission and which produces a total within available funds.

1.26 FAILURE TO ENTER INTO A CONTRACT

A. The Bidder shall forfeit the Bid Security to the Owner as liquidated damages for failure, or refusal, to execute and deliver the Contract, Bond and Certificate of Insurance within the required ten (10) days after notice of the acceptance of the bid.

1.27 SECURITY FOR FAITHFUL PERFORMANCE

A. Simultaneously, with delivery of the executed Contract, the Contractor shall furnish a Surety Bond, or Bonds, as security for faithful performance, the payment of all persons performing labor on the project and furnishing materials in connection with this Contract. The Surety on such Bond or Bonds shall be a duly authorized surety company satisfactory to the Owner and meeting all of the following requirements:

1. Licensed at the time of award by the State of Mississippi's Commissioner of Insurance for the purpose of providing surety.
2. Listed at the time of award in the Department of the Treasury's Federal Register as a company holding certificates of authority as acceptable sureties on Federal Bonds, commonly referred to as the Treasury List.
3. All Bonds shall be executed on the form provided in the Project Manual under Section 00 61 00 entitled *Bond Forms.*
4. A Mississippi Agent or Qualified Non-Resident Agent with Power of Attorney attached or on file with the Contract Administration Engineer, shall countersign all Bonds with the name and address typed, or lettered legibly.
5. All Bonds must be accompanied by an appropriate Power of Attorney.

1.28 BIDDER'S CHECKLIST

A. PROPOSAL FORM

1. Base Bid
   ( ) Write in the amount of the base bid in numbers.

2. Alternates
   ( ) Write in each alternates amount in words and numbers.

3. Certification Form (State Non-Collusion Certificate)
   ( ) Certification (regarding Non-Collusion, Debarment and Suspension, etc.) Form has been executed in duplicate.

4. Acceptance
   ( ) Proposal is signed by authorized person.
   ( ) Name of Business as it appears in the current Mississippi State Board of Contractors Roster.
   ( ) Legal address of the business listed above.
   ( ) Correct Certificate of Responsibility Number(s) as it appears in the current Mississippi State Board of Contractors Roster.

5. Certificate of Responsibility Number(s)
   ( ) Base Bid is under $50,000 and no number is required.
   ( ) Base Bid is under $50,000 and the statement "bid does not exceed $50,000" is on the outside of the sealed envelope.
   ( ) Base Bid is over $50,000 and number is required.
   ( ) Joint Venture and *joint venture* number is required.
   Or
   ( ) Joint Venture participants' numbers are required.

B. BID SECURITY

1. Bid Bond
   ( ) Included Bid Bond payable to the STATE OF MISSISSIPPI with Project number identified thereon,
   Or
   ( ) Included Certified Check payable to the STATE OF MISSISSIPPI with Project number identified thereon.

2. Power Of Attorney
   ( ) Included Power of Attorney

C. NON-RESIDENT BIDDER

1. Preference Law
   ( ) Attached a Copy of Non-Resident Bidder's Preference Law
   Or
   ( ) Attached a Statement

1.29 BIDDER'S CONTACT LIST

A. Proposal And Contract Documents: If the Bidder has any questions pertaining to the following specific areas of the Documents, please direct them to the following individuals:

1.	Additional Proposals	Emma Taylor – Contract Administration	(601) 359-7744
2.	Additional Prints	Clint Wells – MDOT Plans Print Shop	(601) 359-7460
3.	Bid Forms	B.B. House – Contract Admin. Engineer	(601) 359-7730
4.	Specifications	Richard Chisolm – Specifications Engineer	(601) 359-7301
5.	Drawings	Heath Patterson – Construction Engineer	(601) 359-7301

6. Bidder's List & Specimen Proposals are available online at:
   http://www.gomdot.com/Applications/BidSystem/Home.aspx

PART 2 - PRODUCTS & PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 00 22 13 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 WORK IN PROXIMITY OF HIGH VOLTAGE POWER LINES

A. Bidders are hereby advised of Section 45-15-1, et seq., Mississippi Code of 1972, regarding the performance of work in the proximity of high voltage overhead power lines. It is the Contractor's responsibility to comply with those statutory requirements.

1.02 AGENCY, COMMISSION AND OFFICER NAME CHANGES

A. Whenever the term "Mississippi State Highway Department", the word "Department", or variations thereof meaning the Mississippi State Highway Department appears in the plans, proposal, contract documents, and specifications for highway construction projects, in accordance with the laws of the State of Mississippi, it shall mean the "Mississippi Department of Transportation.

B. Whenever the term "Mississippi State Highway Commission", the word "Commission", or variations thereof meaning the Mississippi State Highway Commission appears in the plans, proposal, contract documents, and specifications for highway construction projects, in accordance with the laws of the State of Mississippi, it shall mean the "Mississippi Transportation Commission".

C. Whenever the term "Director", or variations thereof meaning the Chief Administrative Officer of the State Highway Department appears in the plans, proposal, contract documents, and specifications for highway construction projects, in accordance with the laws of the State of Mississippi, it shall mean the "Executive Director of the Mississippi Department of Transportation."

1.03 PLANT PEST QUARANTINES INFORMATION

A. AT the request of the U. S. Department of Agriculture, Plant Pest Control Information Concerning Domestic Quarantines is cited as follows:

B. The entire state of Mississippi has been quarantined for the Imported Fire Ants. Soil and soil-moving equipment operating in the state will be subject to plant quarantine regulations. In general, these regulations provide for cleaning soil from equipment before it is moved from the state. Complete information may be secured from the State of Mississippi Department of Agriculture and commerce, Bureau of Plant Industry, P.O. Box 5207, Mississippi State, Mississippi 39762-5207 – Telephone 325-3390.

<u>IMPORTED FIRE AN QUARANTINES</u>

THE FOLLOWING REGULATED ARTICLES REQUIRE A CERTIFICATE OR PERMIT FOR MOVEMENT:

1. Soil, separately or with other things, except soil samples shipped to approved laboratories*. Potting soil is exempt, if commercially prepared, packaged and shipped in original containers.

2. Plants with roots with soil attached, except houseplants maintained indoors and not for sale.
3. Grass sod.
4. Baled hay and straw that have been stored in contact with the soil.
5. Used soil-moving equipment.

6. Any other products, articles, or means of conveyance of any character whatsoever not covered by the above, when it is determined by an inspector that they present a hazard of spread of the imported fire ant and the person in possession thereof has been so notified.

* Information as to designated laboratories, facilities, gins, oil mils, and processing plants may be obtained from an inspector.

Consult your State or Federal plant protection Inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles. For detailed information see 7 CFR 301.81 for quarantine and regulations.

1.04 FEDERAL BRIDGE FORMULA

A. Bidders are hereby advised that Federal Highway Administration Publication No. FHWA-MC-94-007, BRIDGE FORMULA WEIGHTS, dated January 1994, is made a part of this contract when applicable.

Prior to the preconstruction conference, the Contractor shall advise the Engineer, in writing, what materials, if any, will be delivered to the jobsite via Interstate route(s).

Copies of the BRIDGE FORMULA WEIGHTS publication may be obtained by contacting:

Federal Highway Administration
400 7th Street, SW
Washington, DC 20590
(202) 366-2212
or
http://ops.fhwa.dot.gov/freight/sw/brdgcalc/calc_page.htm

1.05 FUEL TAX APPLICABILITY TO BIDDERS AND CONTRACTORS

A. Bidders are hereby advised that the Mississippi Code of 1972, section 27-55-301 et seq. requires the use of taxed diesel fuel used in performing contracts for construction, reconstruction, maintenance, or repair where such contracts are entered into with the State of Mississippi, any agency, department, institution, or political subdivision thereof. Section 27-55-313 reads as follows:

B. A tax at the rate of Eighteen Cents (18¢) per gallon until the date specified in Section 65-39-35, and Fourteen and Three-fourths Cents (14.75¢) per gallon thereafter, is levied upon any delivering other motor fuel to a retail dealer, user or any other person for use in propelling motor vehicles on the highways of this state and/or for the privilege of

engaging in the business of selling and delivering other motor fuel to any other person who purchases or uses other motor fuel in performing contracts for construction, reconstruction, maintenance or repairs, where such contracts are entered into with the State of Mississippi, any political subdivision of the State of Mississippi, or any department, agency or institution of the State of Mississippi or any political subdivision thereof.

C. A tax at the rate described in this section is hereby levied upon any person who purchases, receives or acquires any other motor fuel upon which the tax has not been paid when such other motor fuel is used for any taxable purpose as set forth in this article. A tax at the rate described in this section is hereby levied upon any retailer who purchases, receives, or acquires any other motor fuel upon which the tax has not been paid when such other motor fuel is sold for use or used for any taxable purpose as set forth in this article.

D. The commission may adopt rules and regulations providing for the issuance of permits to persons performing contracts as hereinabove provided, allowing or requiring said persons to purchase other motor fuel for use in performing said contracts without the payment to the distributor of the tax imposed hereunder, and providing for such persons to report and pay such tax directly to the commission in instances where the commission determines that such payment will facilitate and expedite the collection of the tax which may be due on such purchases by the permittee. The distributor is relieved of collecting and remitting the taxes specified hereunder, when furnished with a copy of said permit, and the person holding the permit shall become liable for such taxes instead of the seller, and the full enforcement provisions of this article shall apply in the collection of the tax from the permittee. The commission may require said person to execute and file with the commission a good and valid bond in a surety company authorized to do business in this state, or with sufficient sureties to be approved by the commission, conditioned that all taxes which may accrue to the State of Mississippi under the provisions of this chapter will be paid when due. Provided further, the commission may accept a bond filed under the provision of Section 27-65-21, when such bond is conditioned upon the payment of taxes hereunder.

E. Any person who shall, while not licensed as a distributor of other motor fuel or retail dealer, sell or deliver to other persons any other motor fuel upon which the tax levied by this article has not been paid shall be liable for the tax and penalties imposed by this article if the person selling or delivering such fuel knows or has reason to know that it will be used or sold for a taxable purpose.

F. A retail dealer may, with the approval of the commission, sell or dispense tax free other motor fuel. Said retailer shall comply with all rules and regulations pertaining to retailers selling or dispensing tax free other motor fuel. The commission may require said retailer to execute and file with the commission a good and valid bond, in a surety company authorized to do business in the state, conditioned that all taxes which may accrue to the State of Mississippi under the provisions of this chapter will be paid when due. Storage tanks or pumps located at all such retail dealers' place of business which are used or to

be used in storing and dispensing kerosene for lamps, stoves, heaters and domestic purposes shall bear the label “not for highway use” of letters of not less than four (4) inches in height.

G. When other motor fuel on which the full tax under this section has been paid has been Delivered to a retail dealer for sale or to a consumer for use as motor fuel for operating a motor vehicle upon the highways of this state, the distributor of other motor fuel who made said tax payments and deliveries may pick up and return to his bulk storage facility any portion of such other motor fuel which may be unused and claim credit for the amount of tax paid on the quantity so returned. In order to claim credit for the tax on the quantity of other motor fuel to be so returned, such distributor shall notify the commission of his desire to so return it. Such transaction shall only be made under the supervision of the commission.

H. When dyed diesel fuel and clear diesel fuel are accidentally mixed and the mixture is converted to nonhighway use diesel fuel, the distributor or other person owning such mixture may claim credit for the highway portion of the tax paid on such mixture. Proof satisfactory to the distributor or other person owning such mixture shall notify the commission immediately after gaining knowledge that such accidental mixture has occurred.

Bidders/Contractors are required to comply with the provisions of said section, and any revisions or amendments thereto, for all work performed under this contract; and be able to substantiate compliance when requested by the Mississippi Department of Transportation or the Mississippi State Tax Commission.

1.06 PROMPT PAYMENT

A. Bidders are hereby advised that the Prime Contractor must pay their subcontractor(s) for satisfactory performance of their contracts no later than a specific number of days from receipt of payment from the Department. Therefore, Prime Contractors are hereby advised of the following:

1. Within 15 calendar days after receiving payment from the Department for work satisfactorily performed, the Prime Contractor shall make prompt payment to all sub-contractors or material suppliers for all monies due.
2. Within 15 calendar days after receiving payment from the Department for work satisfactorily completed, the Prime Contractor shall promptly return all retainage monies due to all sub-contractors or material suppliers.
3. The Engineer will have the authority to suspend the Work wholly or in part and to withhold payments because of the Contractor’s failure to make prompt payment within 15 calendar days as required above, or failure to submit the required OCR-484 Form, “Certification of Payments to Subcontractors”, which is also designed to comply with prompt payment requirements.

1.07 ALTERATIONS IN BIDDING PROCESS

A. Bidders are hereby advised that they may either use the traditional method of entering their Bid information by hand on Section 905--Proposal or may insert printed information obtained from the available Electronic Bid System (EBS).

B. It is the responsibility of every bidder to check for any addendum or modification to the contract document(s) for which they intend to submit a response. It shall be the bidder's responsibility to be sure they are in receipt of all addenda, pre-bid conference information, and/or questions and answers provided at, or subsequent to, the pre-bid conference, if any are issued.

The Mississippi Transportation Commission assumes no responsibility for defects, irregularities or other problems caused by the use of electronic media. Operation of this electronic media is done at the sole risk of the user.

1.08 CONTRACT TIME

A. It is anticipated that the Notice to Award will be issued by not later than August 09, 2011, and the date for Notice to Proceed and Beginning of Contract Time will be September 08, 2011.

B. The calendar date for completion of this Contract shall be January 31, 2013 which date or extended date as provided in Article 8 – TIME shall be the end of contract time.

C. A Construction Schedule as described in Section 01 32 00-Construction Progress Documentation of these Specifications will be required.

1.09 SUBCONTRACTING

A. The Bidder is specifically advised that any person, firm or other party to whom it proposes to award a subcontract must be acceptable to the Owner. The total allowable subcontract amount shall not exceed **sixty percent (60%) of the Contract Sum,** excluding the value of any "Specialty Items" listed below:

1. Specialty Items:
   a. Termite Treatment
   b. Aluminum Composite Panel System
   c. Metal Building System
   d. Plumbing Items
   e. Heating, Ventilating and Air Conditioning Items
   f. Electrical Items
   g. Security and Surveillance Systems

These items are not to be confused with Division 10 – Specialties of the Specifications.

END OF SECTION

SECTION 00 31 32 GEOTECHNICAL DATA

Part 1 GENERAL

1.01 DESCRIPTION

A. The Geotechnical Investigation, Proposed Geotechnical and Research Warehouse, Mississippi Department of Transportation, Jackson, Mississippi, prepared by Mississippi Department of Transportation on January 21, 2011, is hereby made a part of the information made available to Bidders. For brevity, **Geotechnical Data** may also be referred to in the Contract Documents as the "Geotechnical Report" or "Soils Engineering Report".

B. All persons intending to provide goods or services in connection with this Work are required to read and understand the referenced document prior to proceeding.

C. In the event of a conflict between the **Geotechnical Data** and the Construction Documents, notify the Project Engineer in writing of conflict to determine course of action prior to proceeding.

Part 2 PRODUCTS
(Not Used)

Part 3 EXECUTION
(Not Used)

End of Document

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

Inter-Departmental Memorandum

TO: Division Director, ASU (75-20)
Ms. Lori Worley

DATE: January 21, 2011

FROM: Geotechnical Engineer
R. Sean Ferguson

SUBJECT OR PROJECT NO: BWO-9718-25(001)
502350/101000
Geotechnical Rept. 11-25-51

INFORMATION COPY TO:

COUNTY: HINDS

Central File (via Battey)
ASU (Mr. Jim Vinson)
Research Engineer
District Five Engineer
Roadway Design Engineer
Materials Engineer
Project File
Lab File

This is the submission of the geotechnical investigation performed by this office on the soil and foundation conditions for the Geotechnical and Research Warehouse and parking lot proposed for construction immediately east of the Materials Division's Central Laboratory located at the corner of South Stadium Drive and Woodrow Wilson Avenue. Please distribute to the design architects at JBHM Architects, P. A. at your convenience.

If any additional information is needed, or if any questions arise which require further review of site conditions, clarification of the recommendations provided in this report, or development of more specific recommendations, please advise.

RSF

GENERAL

Ten (10) rotary wash soil borings were completed on January 4 and 5 at the proposed building site. The soil borings ranged from 10 feet to 47 feet in depth and were completed for the proposed building structure and proposed parking area. Undisturbed Shelby tube samples were obtained in cohesive soils. Split-spoon samples were not obtained.

From the field boring logs and visual inspection of the samples, a testing program was organized to aid in the classification of the different soil zones encountered, as well as to determine the strength characteristics of each zone. The tests conducted were moisture content, Atterberg limits, volume change, and grain size analysis. The test results are presented in the reference section of this report and on the appropriate boring logs. Boring locations as well as the preliminary building and parking configurations are indicated on Plate 1.

The recommendations provided in this report are based on the information supplied to this office at the time of the geotechnical investigation. It should be pointed out that the boring logs contained in this report are reproductions of the original field boring logs. The soil stratification information presented on the boring logs is formulated from laboratory tests and visual examination of the soil samples obtained during the field exploration. The conclusion of what lies between any and all borings is subject to various interpretations and should be evaluated accordingly.

The remainder of this report deals with this subdivision's findings and conclusions. Any questions concerning the contents of this report, or suggestions as to how this material may be more effectively presented, are welcome.

SOIL CONDITIONS

Warehouse Building

Soil borings B-1, 2, 3, 4, and 7 were completed for the proposed warehouse. In general, the borings encountered 2 to 4 feet of stiff to hard, brown Clayey Silt (CL) and Silty Clay (CL) material with low to moderate shrink-swell potential overlying moderately expansive Pre-Loess Terrace deposits and the hard, yellow, high plasticity weathered Clay (CH) of the Yazoo Formation. The weathered Yazoo clay possesses a high shrink-swell potential and overlies the

hard blue Clay (CH) (unweathered) of the Yazoo Formation. The top of this unweathered clay is located at a depth of approximately 40 feet at this location.

Parking Lot

Soil borings B-5, 6, 8, 9, and 10 were completed for the proposed parking and driveway areas. These borings encountered up to 2 feet of generally stiff to hard, brown Clayey Silt (CL) and Silty Clay (CL) material with low to moderate shrink-swell potential overlying expansive Pre-Loess Terrace clays and silty clays and the hard, yellow, high plasticity weathered Clay (CH) of the Yazoo Formation. The exceptions were at borings B-6 and B-10 where the unweathered Yazoo clay was encountered at the ground surface and a depth of 4 feet, respectively.

At the time the borings were completed, the silty clays and clays encountered at the site were relatively dry to moist with moisture contents near or below their plastic limits. Several samples taken at depths of 2 to 10 feet had liquid limits in excess of 60. Expansive clays in this state have a capacity to attract moisture are highly susceptible to expansive volume change.

For this reason, we recommend that building be constructed on a deep foundation system consisting of drilled, straight shaft piers with an off-grade structural floor slab. Alternatively, the building could be supported on a shallow foundation provided the proposed building area, including a distance of at least 10 feet outside the building lines, be undercut to a depth of 8 feet and backfilled with non-expansive, low permeability select fill material in order to provide a buffer between the bottom of the floor slab and the top of the expansive clay soils. Structural fill requirements are discussed in more detail in the following sections. Once an adequate soil buffer has been provided, the foundation and floor slab for the building could consist of a monolithic slab and grade beam system with exterior perimeter footings and stiffening ribs. Detailed guideline recommendations for the earthwork and foundations for this new structure are provided in the following sections.

GUIDELINE ENGINEERING RECOMMENDATIONS

The proposed warehouse, as planned, is a 35-foot tall, 14,989 square foot two-storey building. Detailed structural loading information was not available; therefore, maximum column loads are assumed to be less than 75 kips per column and maximum wall loads are assumed to be less than 2 kips per linear foot, based on dead plus live load. The proposed finished floor elevation

of the warehouse is 346.95 ft. This is approximately 1 to 2 feet lower than existing ground elevations on the site.

Site Preparation and Earthwork

Surface water drainage should be maintained and improved as practical to divert surface water away from the construction area. The construction of temporary ditches, berms, or the use of swales or other surface water diversion devices should be considered in order to divert water away from and not across the site during construction. Upon completion of construction, the site should be graded to rapidly remove surface water away from the building structure.

The proposed construction area must be cleared and grubbed per Sub-section 201.03.1.2 of the Mississippi Standard Specifications for Road and Bridge Construction, 2004 Edition. Stripping should be carried to a depth where all organic containing soils have been removed. Soils containing these objectionable materials should not be used for backfill. Any topsoil encountered within the construction limits should be stripped and could be stockpiled for landscaping purposes.

Site preparation for this project should also include the relocation of any existing underground utilities and the removal of all existing curbs, gutters, and asphalt or concrete pavements or other obstructions.

FOUNDATION RECOMMENDATIONS

WAREHOUSE BUILDING

DRILLED PIERS WITH OFF-GRADE FLOOR SLAB

Due to the high probability that swelling movements will occur in the dry silty clay and clay soils that are present near the ground surface, it is recommended that the proposed building be supported on a deep foundation system consisting of drilled piers. The drilled piers should be used to support the column loads and grade beams which in-turn support the off-grade, structural floor slab. Piers founded in the reference materials should attain a maximum allowable end bearing capacity of 15,000 pounds per square foot. This value incorporates a factor of safety of 2.5 against shear or plunging failure. Piers at the site should not be constructed with a shaft diameter of less than 24 inches in order to facilitate shaft inspection. Piers should have minimum center to center spacing of 3 diameters.

It is recommended that 30-inch diameter piers be used to support the building and 24-inch diameter piers be used for support of the screen wall. The 30-inch piers should be designed for 6 inches of cover when measured from the vertical reinforcing to the outside edge of the pier. The 24-inch piers should have a minimum 3 inches of cover. All piers should be designed with 5 inches clear space between vertical bars and #4 spirals on a 12-inch pitch.

Drilled Piers - Bearing Depth and Capacity

For this project, we recommend that the drilled piers extend to a depth of at least 40 feet. This depth corresponds to an approximate elevation of 305 feet based on the topographic information that was provided. The piers should be reinforced for their full depth to resist potential tensile forces that may develop due to swelling of the natural soils and any tensile structural loads. Uplift forces due to swelling soils were approximated using the procedure recommended in the 2010 FHWA-NHI-10-016, Drilled Shaft Reference Manual which assumes that the full undrained shear strength (c_u) of the expansive soil will act in uplift on the drilled shaft. This corresponds to application of the α-method with $\alpha = 1.0$. These uplift pressures are assumed in this case to act on the upper 15 feet of the shaft. The uplift force on each pier is resisted by the dead load on the pier and the full-length vertical reinforcing in the pier. The minimum proportion of vertical reinforcing should consist of at least 1% of the gross cross sectional area of the pier. Piers constructed to a depth of 40 feet should develop the capacities listed in the table below with safety factors of 2.5 for compression and 1.62 for tension (dead loads assumed = 0) provided. These capacities were calculated using the allowable unit end bearing capacity noted above plus a unit side friction capacity of 2,000 pounds per square foot acting over the lower 20 feet of each shaft.

40-foot Piers	Estimated Compressive Capacity (kips)	Estimated Uplift Capacity (kips)	Estimated Uplift due to Swelling Soils (kips)
24" Diameter	298	251	155
30" Diameter	387	314	194

Drilled Pier Installation

Drilled piers should be constructed per Section 803 of the Standard Specifications. The concrete should be placed immediately after excavation and inspection of the shaft. The presence of significant groundwater is not anticipated within the near-surface soils. However

some seepage into the excavation is to be expected and may occur at any time. Any groundwater exceeding 3 inches in depth should be pumped from the excavation prior to concrete placement, or the concrete should be placed with a tremie. Based on the conditions encountered in the soil borings, we do not anticipated that the use of slurry will be required to construct these shafts. However, the contractor should have sufficient temporary casing available should it be required.

Grade Beams and Pier Caps

The drilled piers will be connected at the ground surface by the means of concrete grade beams. The grade beams should be isolated from contact with the surface soils by means of a suitable spacer. These spacer materials may consist of cardboard boxes filled with commercial grade vermiculite, "J-voids", closed cell Styrofoam or other suitable materials. This floor system should be designed and constructed with a minimum 12-inch void space between the bottom of the grade beams and the ground surface.

Interior Floor Slab

The most positive method of reducing floor slab movements associated with swelling soils is to use a structurally suspended floor slab in conjunction with a drilled pier foundation system. If this option is utilized, a minimum 24-inch void is recommended beneath the floor system. Utilizing a structurally suspended floor slab in conjunction with drilled piers will eliminate the necessity of remedial earthwork beneath the floor.

All utility lines should be suspended from the floor to minimize the possibility of damage due to the shrinking and swelling movements of the underlying soils. However, at the point where the utilities enter the building, provisions for differential movements between the ground-supported lines and the suspended lines should be made. The design of the utility lines should be such that a minimum 18-inch void space will exist between the suspended utility lines and the surface of the exposed ground surface within the crawl space.

Estimated Movements – Deep Foundation with Off-Grade Floor Slab

With a deep foundation system, off grade floor slab, and drainage provisions as recommended above, we estimate that the differential movement in the floor slab will be less than 1/2 inch. Proper note should be taken that proper design and construction of the foundation elements and floor slabs are required to achieve this level of movement.

Estimated Costs - Drilled Piers

A unit cost is provided based on bid prices from State projects advertised within the last two to three years which utilized drilled pier foundations of similar size and anticipated installation methods. It is expected that piers installed for this project will likely be excavated using the dry method with surface temporary casing, if necessary. We recommend using a unit price of $100 to $150 per linear foot to estimate the cost for installing the deep foundations for the building and screen wall. This price includes the cost of drilled shaft concrete, reinforcing steel, and all labor, materials including mineral slurry, equipment, and incidentals necessary to complete the drilled shafts per Sub-section 803.05.14 of the Standard Specifications.

SHALLOW FOUNDATION ALTERNATIVE

Based on the available information and the results of this geotechnical investigation, consideration may be given to the use of a monolithic, steel reinforced (conventional and/or post-tensioned reinforcing), slab-on-grade foundation system (without piers) with a waffle type grade beam configuration, provided that loads are relatively light and some differential movements can be tolerated. All slabs supporting the warehouse building should have a minimum thickness of 5.5 inches if a shallow foundation is used.

Undercut and Backfill of Building Area (Shallow Foundation Only)

The entire building area, including a distance of at least 10 feet outside of the building footprint should be undercut to a depth of 8 feet and backfilled with select fill materials to provide a buffer between the foundation and the underlying expansive clay soils.

Proof Rolling

After achieving finished subgrade elevation in cut areas and prior to placing fill in any areas that are currently below finished subgrade elevation, the exposed subgrade should be evaluated to confirm that all soft, yielding and unsuitable materials have been removed. During this evaluation, those areas which are at finished subgrade or are to receive fill should be proof rolled. The proof rolling should be performed with a loaded tandem-axle dump truck or other vehicle approved by the Engineer. Proof rolling will help reveal the presence of unstable materials that were not identified during the field investigation. Any areas, which are soft or pump during proof rolling should be overexcavated and recompacted with suitable select fill materials.

Select Fill Materials, Placement and Compaction

Fill used to bring the site to grade should be either a low plasticity silty clay (CL) or sandy clay (CL) fine-grained soil meeting the requirements for Class B6-10 borrow material (plasticity index, PI, between 10 and 25), with the exception that at least 50% of the material used should pass the #200 sieve. This material should meet all requirements of Section 703.21 of the Standard Specifications for borrow material. It is estimated that a limited quantity of the on-site soils may be suitable for use as structural fill. All materials excavated from the building area which are unsuitable for use as select fill material should be removed and disposed of off- site. Prior to placing fill, the native silty clay subgrade soils should be lightly scarified and compacted to between 95 and 98% of the standard Proctor maximum dry density at a moisture content between optimum and +4% of optimum for a depth of 6 inches below the surface.

After subgrade preparation and observation have been completed, fill placement may begin. The fill should be placed in loose lifts that are graded to provide a uniform thickness not exceeding 8 inches per Section 203 of the Standard Specifications. The surface of each preceding, compacted lift should be scarified to ensure adequate bonding between lifts. Field density tests should be completed in each lift of the fill material to provide some assurance that adequate and uniform densities are being obtained. At least one field density test should be performed by the Department for every 1,000 square feet of lift surface area. During compaction, the moisture content of the soil should be maintained within plus or minus 3% of the optimum moisture content as determined by the Standard Effort laboratory compaction test (AASHTO T 99). Each lift should be compacted to achieve a minimum of 98% of the Standard Effort maximum dry density with stability present. Stability is defined as the absence of pumping or rutting under the load of construction equipment or a loaded dump truck.

Grade Beams

Grade beams (stiffener beams) supported on compacted fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot based on dead load plus design live load considerations. All grade beams should have a minimum width of 10 inches, and should bear entirely in compacted select fill material. Perimeter grade beams should have a minimum width of at least 12 inches and should bear at least 24 inches below adjacent surface grades. Beams should be formed by placing compacted select fill material to underslab grade and then trenching the beams with a power trencher or similar equipment. This method adds support to the slab and helps it resist deflections by effectively reducing the potential expansion of the

underlying soils. If soft or loose soils are encountered at the design bearing level, they should be undercut to stiff or dense soils and the excavation back-filled with concrete.

Grade beam excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. Slabs should be stiffened utilizing interior ribs spaced not more than 18 feet on center in each direction. These ribs should extend at least 18 inches below the bottom of the slab, and together with exterior grade beams should be reinforced for both positive and negative bending. The floor slabs should be reinforced, and can be designed based on a modulus of subgrade reaction of 125 pounds per cubic inch.

Uniform compaction of fill materials is critical to reduce total and differential settlement. If the site is prepared as recommended, total movements of the slab should not exceed 1 ½ inches. It is recommended that a 3/8 inch catalytically blown or sprayed asphalt membrane be installed prior to placing slab concrete. The waterproofing should be placed to provide a continuous sheet under the entire slab.

Spread Footings

Spread footings, if necessary to carry isolated column loads, should be properly dimensioned using a net allowable bearing capacity of 2,500 pounds per square foot and should bear at the depth required to adequately satisfy the design compression and uplift loading conditions. The uplift capacity of an individual spread footing should be taken as equal to the weight of the concrete in the footing and pedestal plus the weight of the backfill soils lying directly over the footing. The weight of the concrete should be taken as 150 pounds per cubic foot and the weight of the backfill soils should be taken as 115 pounds per cubic foot provided that the soils are adequately compacted as per the Specifications. When the weight of the backfill soils is added to the weight of the concrete footing and pedestal, and then divided by the uplift force, the resulting factor of safety against uplift for the footing should exceed 1.3. The final dimensions of the footing and footing reinforcement should satisfy both the requirements for the compressive and uplift capacities of the footing.

Differential Movements

Even when designed with adequate safety factors against bearing capacity failure, foundation and floor slab movements can occur. Settlements can result from immediate deflection (essentially, upon load application) and consolidation (over an extended period) in response to stress increase. Both uplift and downward foundation movement can occur due to the swelling and shrinkage of plastic soils as the moisture content of the soils increase and decrease, respectively. With properly designed and constructed earthwork and foundations, the total movement of this structure could be on the order of about 2 inches with differential movements predicted to be about 1 to 1 ½ inches.

PAVEMENTS

Driveway and Parking Areas

Driveway and parking areas will be constructed on the north and east sides of the warehouse building. Concrete paving will be constructed along the north side of the warehouse to provide truck access to the lift gate and bay doors. Concrete paving is also planned for the dumpster pad. Soil conditions at the location of these parking areas were investigated. Expansive clays exist at or near the ground surface over much of the proposed parking areas. For this reason we recommend a 3-foot undercut. This excavated material should be wasted off-site.

The subgrade should be prepared according to the recommendations provided earlier in the report, and select fill material should be used to bring the area to subgrade elevation. However, prior to placement of pavement, the subgrades should be lime treated and compacted to at least 95% of maximum dry density as determined by the standard Proctor procedures. The top 6 inches of design soil should be lime treated with 6 percent hydrated lime by dry weight of soil. The lime stabilized subgrade layer should be constructed according to Section 307 of the Standard Specifications. If the subgrade soils are prepared and select fill materials are placed according to Section 203 of the Standard Specifications, a design subgrade CBR value of 6 is appropriate for flexible pavement design.

For the north parking lot we recommend a minimum of 9 inches of full depth flexible asphalt pavement to accommodate moderate to heavy truck traffic. The top 2 inches should be asphalt wearing course with 7 inches of asphalt base. For the east parking area which should consist mainly of automobile and light truck traffic, we recommend 7 1/2 inches of full depth asphalt including a 1 ½ inch wearing course.

Concrete Pavement Slab for Truck Access and Dumpster Pad

A concrete slab will be constructed along the north side of the warehouse building, and a dumpster pad is planned on the northeast corner of the lot. A typical design for the anticipated loads applied to these slabs would consist of a minimum 9-inch thick concrete slab with a mat of reinforcing steel. Reinforcement should consist of No. 4 bars spaced at 12 inches on center in both directions having a minimum cover of 2 inches. Tooled contraction joints should be provided at intervals that will provide a slab size that does not exceed 20 feet by 20 feet. Expansion joints should not be placed in these pads unless they are required where the slabs directly abut the building or other fixed structure.

Secondary Design Considerations

The following recommendations should be incorporated into the plans and specifications and should improve the performance of the structures constructed on the site:

1. Prior to construction, the area to be covered by buildings should be prepared so that water will not pond beneath or around the buildings after periods of rainfall. In addition, water should not be allowed to pond on or around pavements. Paved areas and the general ground surface should be sloped away from buildings on all sides so that water will always drain away from the structures.
2. Water should not be allowed to pond near buildings after the floor slabs and foundations have been constructed. Sidewalks should not be structurally connected to buildings. They should be sloped away from buildings so that water will be drained away from structures. Water sprinkling systems should not be located where water will be sprayed onto building walls and subsequently drain downward and flow into the soils beneath foundations. Roof drainage should be collected and transmitted by pipe to a storm drainage system or to an area where the water can drain down-slope away from buildings and pavements.

3. Backfill for utility lines that are located in pavement, sidewalk and building areas should consist of on-site fill. The backfill should be compacted as described in the **Site Preparation and Select Fill Materials** section of this report. Lesser lift thicknesses may be required to obtain adequate compaction. Care should be exercised to make sure that ditches for utility lines do not serve as conduits that transmit water beneath structures or pavements. The top of the ditch should be sealed to inhibit the inflow of surface water

during periods of rainfall. Utilities that project through slab-on-grade floors, particularly where expansive soils or soils subject to settlement are present, should be designed with some degree of flexibility and/or with a sleeve to reduce the potential for damage to the utilities should movement occur.

4. Flower beds and planting areas should not be constructed along building perimeters. Constructing sidewalks or pavements adjacent to buildings would be preferable. If required, flower beds and planting areas could be constructed beyond the sidewalks away from the buildings. If it is desired to have flower beds and planting areas adjacent to a building, the use of above grade concrete box planters, or other methods that reduce the likelihood of large changes in moisture content of soils adjacent to or below structures should be considered.

5. Trees and large shrubs in general should not be planted closer to a structure than the mature height of the tree. A tree planted closer to a structure than the recommended distance may extend its roots beneath the structure, allowing removal of subgrade moisture and/or causing structural distress.

run East for a distance of 27
Northern right-of-way line of
of South Stadium Drive, as bo
also being the POINT OF BEGIN
thence, following the aforesaid
run South 89 degrees 37 minu
Deed) for a distance of 250.00
seconds West a distance of 0.
aforesaid Northern right-of-wa
19 minutes 35 seconds East
250.00 feet to a set 5/8" iro
West (North 89 degrees 55 se
5/8" iron rod on the aforesaid
following the aforesaid Eastern
degrees 19 minutes 35 second
distance of 250.00 feet back

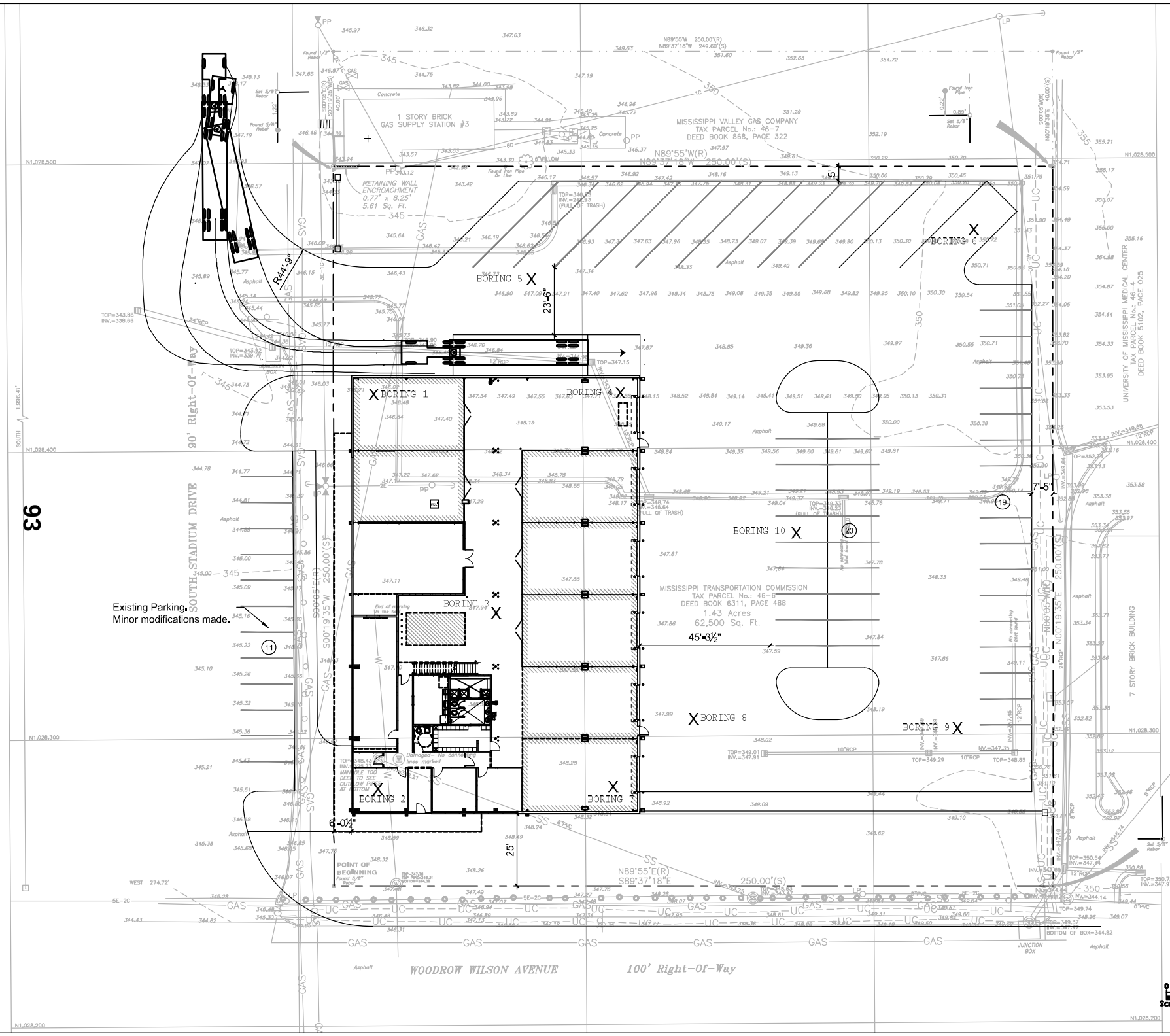

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PLATE 1

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 1	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32739	LONGITUDE: W-90.18086	COMPLETION DATE: 1-4-11
LOCATION: NW CORNER OF PROPOSED GEOTECHNICAL WAREHOUSE BUILDING			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 42'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 346.5'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
		@ 2' STIFF BROWN SILTY CLAY					
	T		CL	0.75 TSF		VOLUME CHANGE = 53%	
5	T		CH	1.5 TSF			VC:98%
	T		CL	1.25 TSF	100		VC:53%
	T			2.0 TSF			
10	T	WEATHERED YAZOO FORMATION	CH	2.0 TSF			VC:147%
		@ 12' VERY STIFF YELLOW CLAY					
	T			2.0 TSF			
15	T			2.5 TSF			
20	T			3.5 TSF			
25	T			4.25 TSF			
30	T			2.75 TSF			
		UNWEATHERED YAZOO FORMATION					
35	T	@ 35' VERY HARD BLUISH CLAY		4.5 TSF			
40	T	@ 40' VERY HARD BLUISH CLAY		4.5 TSF			
		TOTAL DEPTH OF BORING - 42'					
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 2

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 2	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32702	LONGITUDE: W-90.18086	COMPLETION DATE: 1-4-11
LOCATION: SW CORNER OF PROPOSED GEOTECHNICAL WAREHOUSE BUILDING			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 47'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 349.2'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 2' VERY HARD BROWN CLAYEY SILT		4.5 TSF			
5	T	@ 4' VERY HARD BROWN CLAY	CL	4.5 TSF			VC:42%
	T			2.5 TSF			
	T			2.25 TSF			
10	T			3.25 TSF			
	T		CH	3.5 TSF			VC:109%
15	T	WEATHERED YAZOO FORMATION @ 16' HARD YELLOW CLAY		3.5 TSF			
			CH	3.0 TSF	95		VC:96%
20	T			4.5 TSF			
25	T			4.0 TSF			
30	T			4.0 TSF			
35	T			3.5 TSF			
40	T	UNWEATHERED YAZOO FORMATION @ 40' VERY HARD BLUISH CLAY		4.5 TSF			
45	T	@ 45' VERY HARD BLUISH CLAY		4.5 TSF			
		TOTAL DEPTH OF BORING - 47'					
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 3

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 3	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32718	LONGITUDE: W-90.18071	COMPLETION DATE: 1-4-11
LOCATION: CENTER OF PROPOSED GEOTECHNICAL WAREHOUSE BUILDING			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 47'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 348.0'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
		@ 2' HARD BROWN SILTY CLAY	CL	3.5 TSF			VC:53%
	T						
		@ 4' VERY HARD BROWN CLAY	CH	3.5 TSF			VC:58%
5	T						
	T			2.5 TSF			
	T			2.5 TSF	111		
10							
	T	WEATHERED YAZOO FORMATION @ 12' HARD YELLOW CLAY		3.75 TSF			
	T			2.75 TSF			
15	T			2.5 TSF			
				4.25 TSF			
20	T			4.0 TSF			
25	T			2.5 TSF			
30	T			3.0 TSF			
35	T			4.5 TSF			
		UNWEATHERED YAZOO FORMATION @ 40' VERY HARD BLUISH CLAY					
40	T			4.5 TSF			
45	T	@ 45' VERY HARD BLUISH CLAY		4.5 TSF			
		TOTAL DEPTH OF BORING - 47'					
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 4

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 4	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32718	LONGITUDE: W-90.18071	COMPLETION DATE: 1-4-11
LOCATION: NE CORNER OF PROPOSED GEOTECHNICAL WAREHOUSE BUILDING			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 42'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 347.2'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 2' HARD BROWN SILTY CLAY	CL	2.5 TSF			VC:35%
5	T			2.25 TSF			
		@ 6' VERY STIFF ORANGISH BROWN SILTY CLAY		1.75 TSF			
	T	WEATHERED YAZOO FORMATION	CH	2.5 TSF			VC:137%
10	T	@ 10' HARD YELLOW CLAY		2.0 TSF			
	T			2.5 TSF			
15	T			2.5 TSF			
				4.25 TSF			
20	T			3.0 TSF			
25	T			3.0 TSF			
30	T			3.25 TSF			
		UNWEATHERED YAZOO FORMATION					
35	T	@ 35' VERY HARD BLUISH CLAY		4.5 TSF			
40	T	@ 40' VERY HARD BLUISH CLAY		4.5 TSF			
		TOTAL DEPTH OF BORING - 42'					
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 5

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 5	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32750	LONGITUDE: W-90.18066	COMPLETION DATE: 1-5-11
LOCATION: NW CORNER OF PROPOSED PARKING LOT, GEOTECH WAREHOUSE			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 14'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 350.4'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 0' HARD BROWN SILTY CLAY	CL	3.5 TSF			VC:39%
	T		CL	1.75 TSF			VC:33%
5	T			1.0 TSF			
	T	WEATHERED YAZOO FORMATION @ 8' VERY STIFF TO HARD YELLOW CLAY		2.0 TSF			
	T			2.0 TSF			
10	T			2.5 TSF			
	T	@ 10' HARD YELLOW CLAY		3.25 TSF			
15		TOTAL DEPTH OF BORING - 14'					
20							
25							
30							
35							
40							
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 6

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 6	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32753	LONGITUDE: W-90.18019	COMPLETION DATE: 1-5-11
LOCATION: NE CORNER OF PROPOSED PARKING LOT, GEOTECH WAREHOUSE			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 10'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 346.7'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 0' VERY STIFF BROWN CLAY	CH	1.75 TSF			VC:98%
	T	WEATHERED YAZOO FORMATION	CH	1.5 TSF			VC:139%
5	T	@ 4' VERY STIFF YELLOW CLAY	CH	1.75 TSF			VC:150%
	T		CH	2.0 TSF	85		VC:159%
	T	@ 8' HARD YELLOW CLAY		3.0 TSF			
10		TOTAL DEPTH OF BORING - 10'					
15							
20							
25							
30							
35							
40							
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 7

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 7	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32702	LONGITUDE: W-90.18051	COMPLETION DATE: 1-5-11
LOCATION: SE CORNER OF PROPOSED GEOTECHNICAL WAREHOUSE BUILDING			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 37'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 348.1'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 2' VERY HARD BROWN CLAYEY SILT		4.5 TSF			
5	T	@ 4' VERY HARD BROWN SILTY CLAY	CL	4.5 TSF			VC:24%
	T			4.25 TSF			
	T	WEATHERED YAZOO FORMATION		4.0 TSF			
10	T	@ 10' HARD YELLOW CLAY		3.5 TSF			
	T						
15	T			3.5 TSF			
20	T			2.75 TSF			
25	T			3.0 TSF			
30	T	UNWEATHERED YAZOO FORMATION @ 30' VERY HARD BLUE CLAY		4.5 TSF			
35	T	@ 35' VERY HARD BLUE CLAY		4.5 TSF			
		TOTAL DEPTH OF BORING - 37'					
40							
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 8

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 8	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32707	LONGITUDE: W-90.18049	COMPLETION DATE: 1-5-11
LOCATION: SW CORNER OF PROPOSED PARKING LOT, GEOTECH WAREHOUSE			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 12'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 347.7'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % (20 40 60 80) — LIQUID LIMIT	ELEVATION, ft.
	T	@ 0' HARD BROWN SILTY CLAY	CL/ML	3.5 TSF			VC:26%
	T		CL	4.5 TSF			VC:40%
5	T	WEATHERED YAZOO FORMATION @ 6' VERY STIFF TO HARD YELLOW CLAY		3.0 TSF			
	T			2.0 TSF			
	T			3.0 TSF			
10	T	@ 10' HARD YELLOW CLAY		3.0 TSF			
		TOTAL DEPTH OF BORING - 12'					
15							
20							
25							
30							
35							
40							
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 9

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.: 9	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32707	LONGITUDE: W-90.18020	COMPLETION DATE: 1-5-11
LOCATION: SE CORNER OF PROPOSED PARKING LOT, GEOTECH WAREHOUSE			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 12'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 348.6'

DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	COHESION, kip/sq ft (1 2 3 4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (20 40 60 80)	ELEVATION, ft.
	T	@ 0' HARD YELLOW CLAY	CL	2.25 TSF			VC:73%
		WEATHERED YAZOO FORMATION					
	T		CH	2.0 TSF			VC:170%
5	T			2.75 TSF			
	T			2.25 TSF			
	T			2.25 TSF			
10	T	@ 10' HARD YELLOW CLAY		3.75 TSF			
		TOTAL DEPTH OF BORING - 12'					
15							
20							
25							
30							
35							
40							
45							
50							
55							

REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

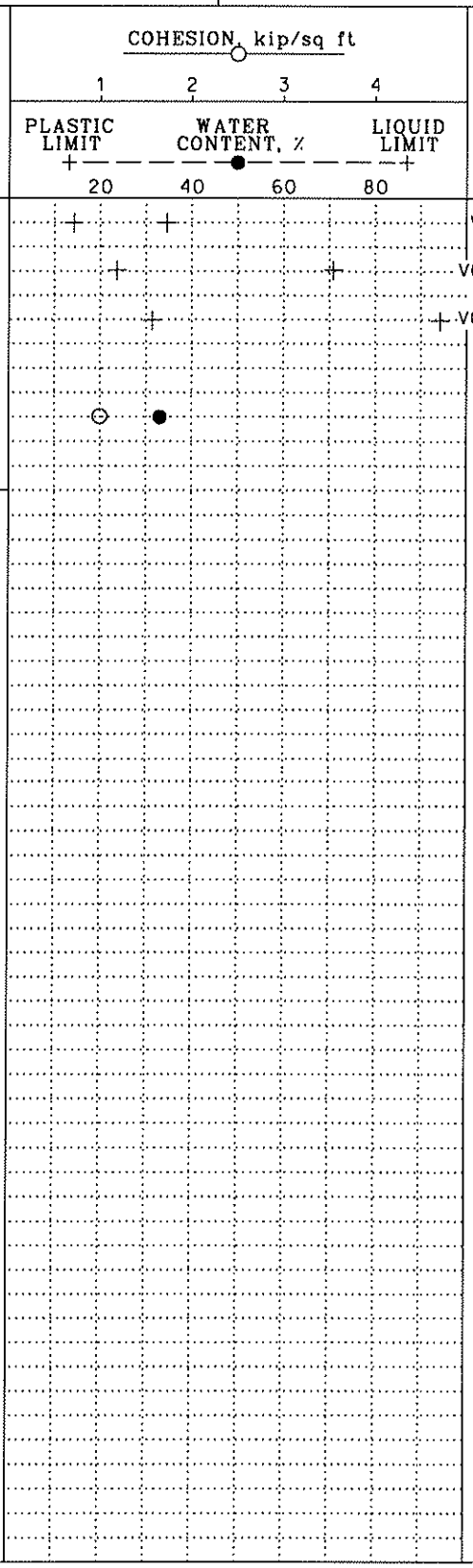
PLATE: 10

DRAWING NO.: 11-25-51.DGN

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SITE NO.: 11-25-1125	HOLE NO.:10	PROJ. NO.: BWO-9718-25(001)	REPORT NO: 11-25-51
COUNTY: HINDS	LATITUDE: N32.32725	LONGITUDE: W-90.18037	COMPLETION DATE:1-5-11
LOCATION: CENTER OF PROP. PARKING LOT, EAST OF PROP. GEOTECH WAREHOUSE			WATER TABLE ELEVATION: N/A
	LOCATION: EAST OF 412 WOODROW WILSON AVE.		COMPLETION DEPTH: 12'
BORING TYPE: ROTARY WASH	LOGGED BY: ANTOINE COX		SURFACE ELEVATION: 347.5'

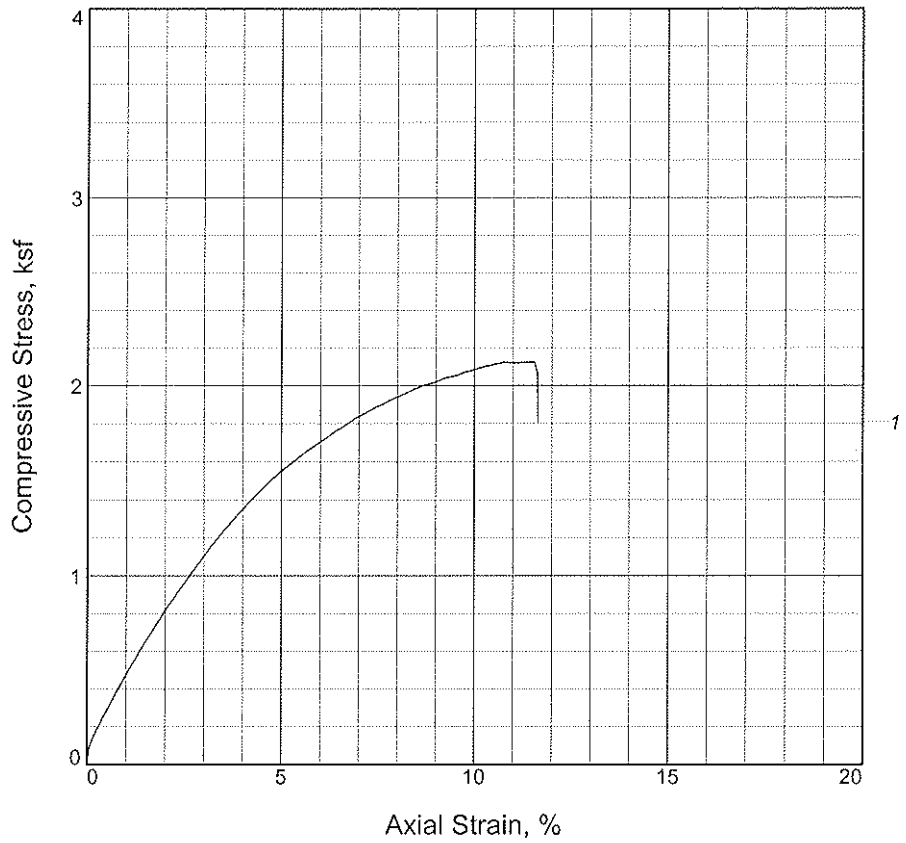
DEPTH, ft.	SAMPLES	DESCRIPTION OF MATERIAL	USCS	POCKET PENETROMETER	UNIT DRY WT. lb/cu ft	ELEVATION, ft.
	T	@ 0' VERY STIFF YELLOW CLAY	CL	1.25 TSF		VC:46%
	T	WEATHERED YAZOO FORMATION	CH	2.5 TSF		VC:138%
5	T		CH	2.5 TSF		VC:141%
	T			1.75 TSF		
	T			3.0 TSF	91	
10	T	@ 10' HARD YELLOW CLAY		3.25 TSF		
		TOTAL DEPTH OF BORING - 12'				
15						
20						
25						
30						
35						
40						
45						
50						
55						



REV. 9/04 S: Split Spoon, T: Shelby Tube, C: Rock Core, P: Pitcher Sampler

PLATE: 11

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	2.12			
Undrained shear strength, ksf	1.06			
Failure strain, %	11.6			
Strain rate, %/min.	1.00			
Water content, %	24.4			
Wet density, pcf	123.8			
Dry density, pcf	99.5			
Saturation, %	95.0			
Void ratio	0.6942			
Specimen diameter, in.	2.85			
Specimen height, in.	5.80			
Height/diameter ratio	2.04			

Description: STIFF BROWN SILTY CLAY

LL = 45	**PL =** 18	**PI =** 27	**Assumed GS=** 2.70	**Type:** UNCONFINED

Project No.: 502350/101
Date Sampled:
Remarks:
HOLE 1 SAMPLE 3

Client: MDOT

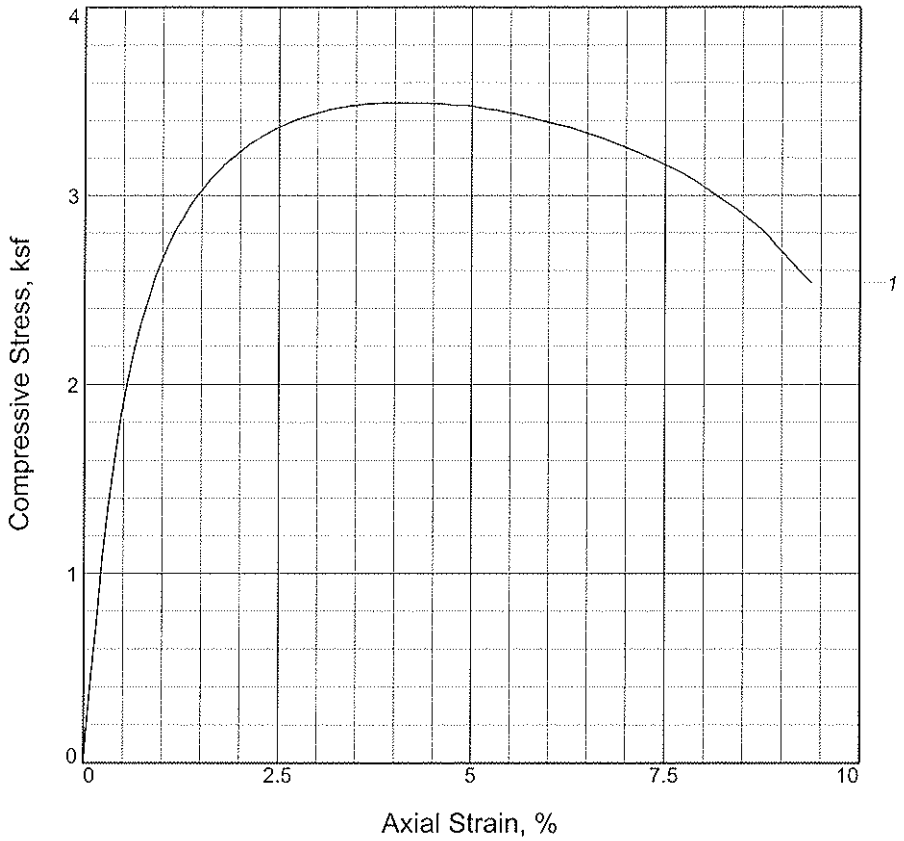
Project: HINDS 11-25-1125
HOLES 1-10 FERGUSON
Source of Sample: B-1 **Depth:** 6'-8'
Sample Number: 3

UNCONFINED COMPRESSION TEST
Mississippi Department of Transportation
Jackson, Mississippi

Figure 12

Tested By: JR

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	3.49			
Undrained shear strength, ksf	1.75			
Failure strain, %	4.1			
Strain rate, %/min.	1.00			
Water content, %	28.2			
Wet density, pcf	121.4			
Dry density, pcf	94.7			
Saturation, %	97.6			
Void ratio	0.7802			
Specimen diameter, in.	2.85			
Specimen height, in.	5.80			
Height/diameter ratio	2.04			

Description: HARD YELLOW CLAY, WEATHERED YAZOO FM (CH)

LL = 67	**PL =** 20	**PI =** 47	**Assumed GS=** 2.70	**Type:** UNCONFINED

Project No.: 502350/101
Date Sampled:
Remarks:
HOLE 2 SAMPLE 8

Client: MDOT

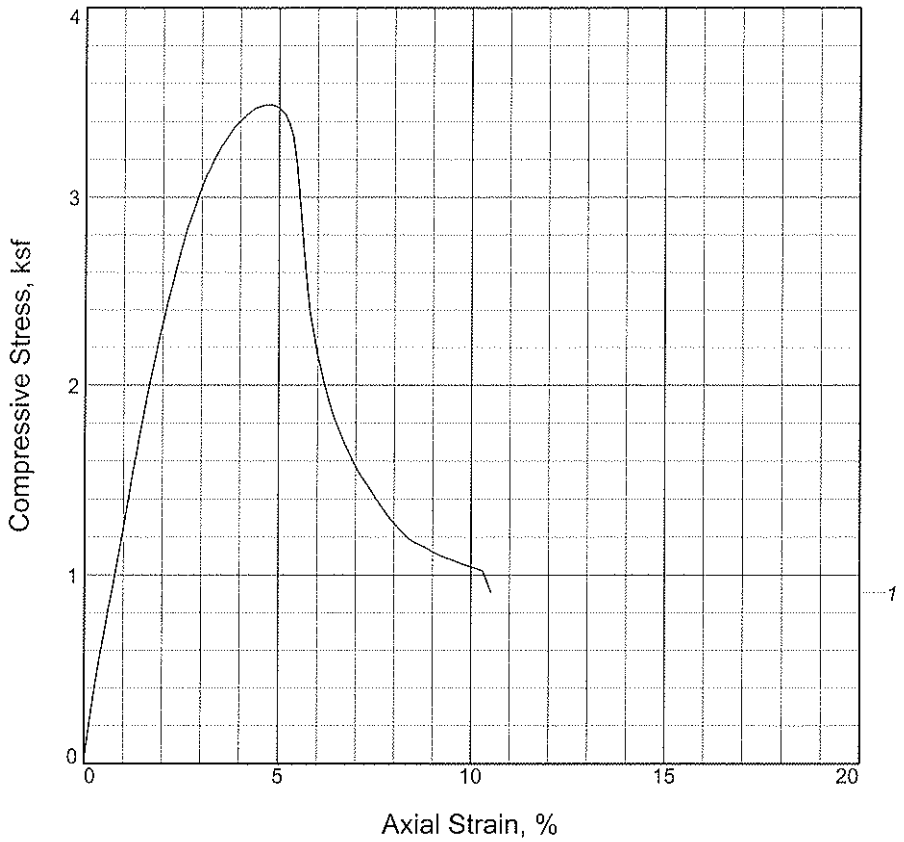
Project: HINDS 11-25-1125
HOLES 1-10 FERGUSON
Source of Sample: B-2 **Depth:** 16'-18'
Sample Number: 8

UNCONFINED COMPRESSION TEST
Mississippi Department of Transportation
Jackson, Mississippi

Figure 13

Tested By: JR

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	3.49			
Undrained shear strength, ksf	1.74			
Failure strain, %	4.8			
Strain rate, %/min.	1.00			
Water content, %	17.9			
Wet density, pcf	130.7			
Dry density, pcf	110.9			
Saturation, %	92.8			
Void ratio	0.5202			
Specimen diameter, in.	2.85			
Specimen height, in.	5.80			
Height/diameter ratio	2.04			

Description: HARD BROWN SILTY CLAY

LL =	**PL =**	**PI =**	**Assumed GS=** 2.70	**Type:** UNCONFINED

Project No.: 502350/101
Date Sampled:
Remarks:
HOLE 3 SAMPLE 4

Client: MDOT

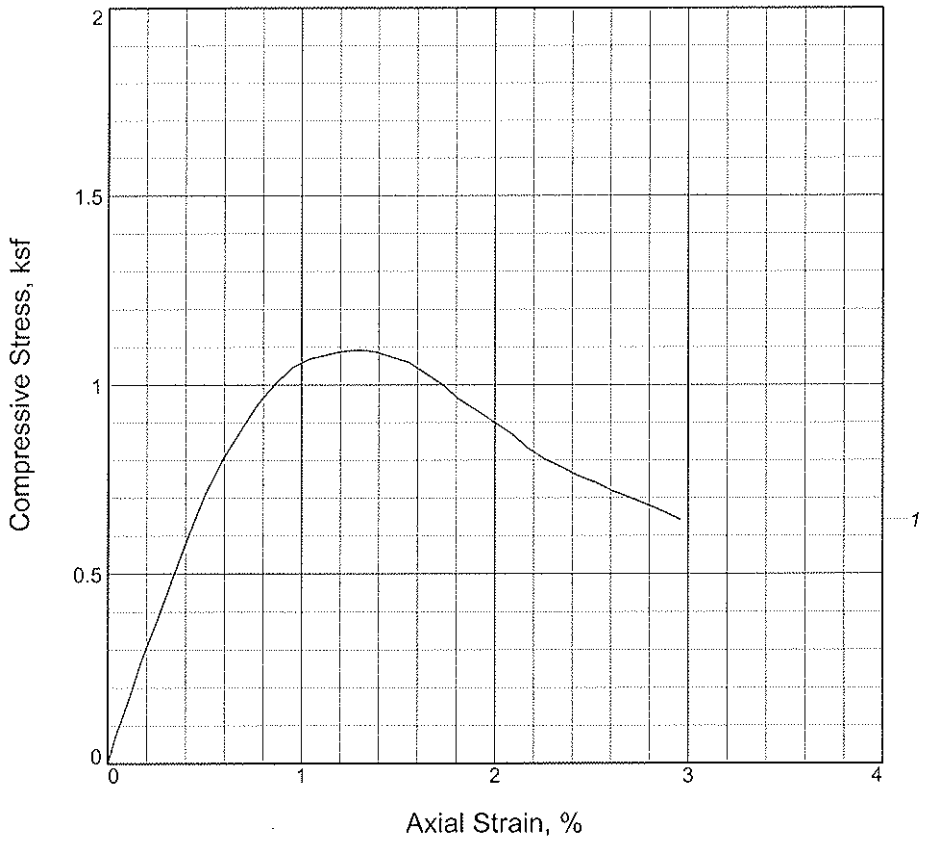
Project: HINDS 11-25-1125
HOLES 1-10 FERGUSON
Source of Sample: B-3 **Depth:** 8'-10'
Sample Number: 4

UNCONFINED COMPRESSION TEST
Mississippi Department of Transportation
Jackson, Mississippi

Figure 14

Tested By: JR

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	1.09			
Undrained shear strength, ksf	0.55			
Failure strain, %	1.3			
Strain rate, %/min.	1.00			
Water content, %	35.1			
Wet density, pcf	114.8			
Dry density, pcf	85.0			
Saturation, %	96.4			
Void ratio	0.9824			
Specimen diameter, in.	2.85			
Specimen height, in.	5.80			
Height/diameter ratio	2.04			

Description: VERY STIFF YELLOW CLAY, WEATHERED YAZOO FM (CH)

LL = 106	**PL =** 29	**PI =** 77	**Assumed GS=** 2.70	**Type:** UNCONFINED

Project No.: 502350/101
Date Sampled:
Remarks:
HOLE 6 SAMPLE 4

Client: MDOT

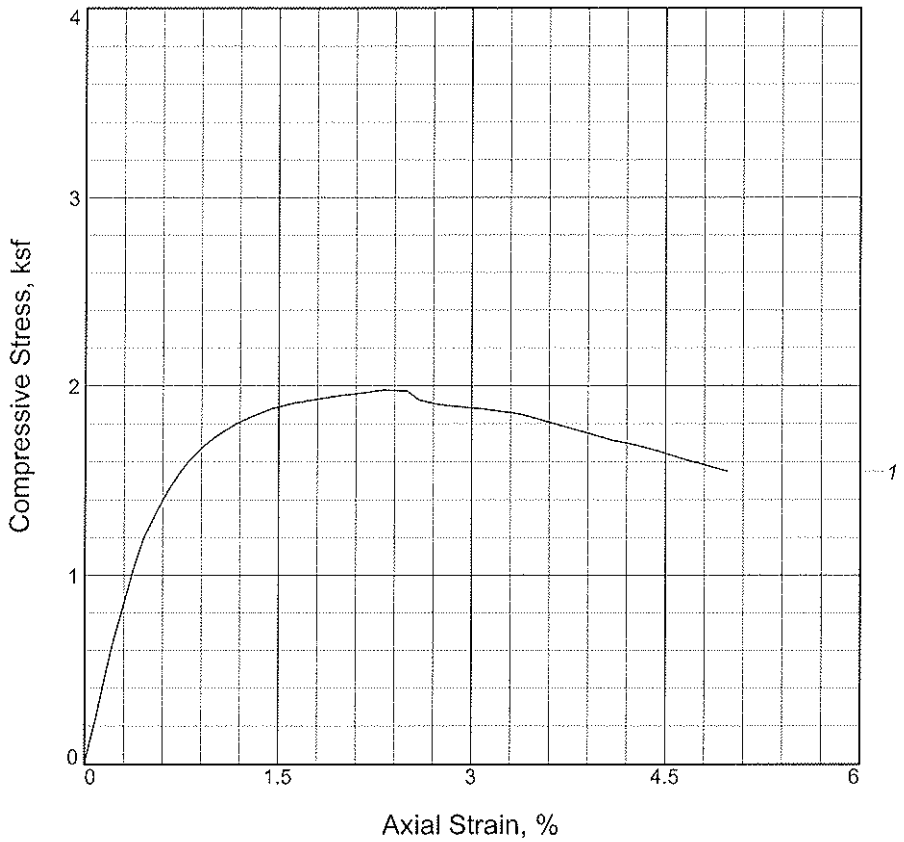
Project: HINDS 11-25-1125
HOLES 1-10 FERGUSON
Source of Sample: B-6 **Depth:** 6'-8'
Sample Number: 4

UNCONFINED COMPRESSION TEST
Mississippi Department of Transportation
Jackson, Mississippi

Figure 15

Tested By: JR

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	1.98			
Undrained shear strength, ksf	0.99			
Failure strain, %	2.3			
Strain rate, %/min.	1.00			
Water content, %	31.9			
Wet density, pcf	119.6			
Dry density, pcf	90.7			
Saturation, %	100.4			
Void ratio	0.8589			
Specimen diameter, in.	2.85			
Specimen height, in.	5.80			
Height/diameter ratio	2.04			

Description: HARD YELLOW CLAY, WEATHERED YAZOO FM (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.70	**Type:** UNCONFINED

Project No.: 502350/101

Date Sampled:

Remarks:
HOLE 10 SAMPLE 5

Client: MDOT

Project: HINDS 11-25-1125
HOLES 1-10 FERGUSON

Source of Sample: B-10 **Depth:** 8'-10'

Sample Number: 5

UNCONFINED COMPRESSION TEST
Mississippi Department of Transportation
Jackson, Mississippi

Figure 16

Tested By: JR

SECTION 00 72 00 GENERAL CONDITIONS

PART 1- GENERAL

1.01 DESCRIPTION.

A. The American Institute of Architects **AIA DOCUMENT A201-2007**, "General Conditions of the Contract for Construction", 2007, Sixteenth Edition, Articles 1 through 15 inclusive, except as may be added to or modified herein, is hereby made a part of the Contract Documents. For brevity, **AIA DOCUMENT A201-2007** is also referred to in the Contract documents as the "General Conditions".

B. All persons intending to provide goods or services in connection with this Work are required to read and understand the referenced document prior to proceeding.

C. See Document 00800-*Supplementary Conditions.* In the event of a conflict between the **AIA DOCUMENT A201-2007,** "General Conditions of the Contract for Construction", 2007, Sixteenth Edition and Document 00800-*Supplementary Conditions,* Document 00800 shall control even if the conflicting provision in the **AIA DOCUMENT A201-2007** "General Conditions of the Contract for Construction" is not expressly deleted or revised by reference in Document 00800.

END OF SECTION

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
Shop Building for Materials Laboratory
Jackson, Hinds County, Mississippi

THE OWNER:
(Name, legal status and address)
Mississippi Department of Transportation
PO Box 1850
Jackson, Mississippi

THE ARCHITECT:
(Name, legal status and address)
JBHM Architects, PA
308 East Pearl Street, Ste. 300
Jackson, Mississippi 39201

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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7 CHANGES IN THE WORK

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9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

Init. /

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

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the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

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facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

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the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

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§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be

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required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

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§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

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§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

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§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may

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be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

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the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

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.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

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§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon 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, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

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.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a separate contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect,

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stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the

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Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

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§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction

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of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or

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otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

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Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

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§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

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§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

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.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

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§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

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§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

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§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an

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additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

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I, Diana Key, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with this certification at 12:56:07 on 03/22/2011 under Order No. 0584116776_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007, General Conditions of the Contract for Construction, as published by the AIA in its software, other than changes shown in the attached final document by underscoring added text and striking over deleted text.

Jann W Vinson

(Signed)

MDOT Architect

(Title)

March 28, 2011

(Dated)

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SECTION 00 73 00 SUPPLEMENTARY CONDITIONS

SUMMARY

1.01 DESCRIPTION

A. **Owner:** These supplements are necessary because the Owner is an agency, or political subdivision, of the State of Mississippi and occupies a different position from that of the usual Owner.

B. **Document:** The following supplements modify, change, delete from, or add to the **AIA DOCUMENT A201-2007**, "General Conditions of the Contract for Construction". When any Article of the General Conditions is modified, or deleted, by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause will remain in effect. The "General Conditions of the Contract for Construction" may also be supplemented or amplified elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, Division 01 of the Specifications.

1.02 Verification Of Dimensions: Before ordering any materials or doing any work, the Contractor shall verify the dimensions and shall be responsible for the accuracy of such dimensions as they affect the Work. No extra compensation will be allowed on account of differences between the dimensions shown on the Drawings and actual dimensions.

1.03 Plans And Specifications: The Specifications and the Drawings are intended to be in agreement with each other, and to be mutually explanatory. They are also intended to be complementary and any Work or material called for by either shall be provided as if called for by both.

1.04 Execution Of The Work: Sections of Division 01 General Requirements govern the execution of the Work of all Sections in Divisions 02-49 of the Specifications.

1.05 Workmanship: All Work as described or required shall be executed in a neat, skillful manner, in accordance with the best-recognized trade practice. Only competent workmen (including the superintendent), who work and perform their duties satisfactorily shall be employed on the Project. When requested by the Project Engineer, the Contractor shall discharge and shall not re-employ on the Project, any person who commits trespass or who is, in the opinion of the Project Engineer, dangerous, disorderly, insubordinate, incompetent, or otherwise objectionable.

1.06 Use Of Site And Facilities: Contractor shall not allow tradesman, technicians and laborers to enter other portions of existing facilities except as predetermined and approved by the Project Engineer. Existing utilities shall not be interrupted unless pre-approved by the Project Engineer. Parking for construction vehicles shall be in areas designated by the Owner at the Pre-construction Conference.

1.07 Utilities: The Owner will furnish utilities for construction (electricity and water). Contractor must use "as- is" or pay for any necessary modifications.

1.08 Substitutions: The Architect will NOT consider requests for substitutions during bidding.

1.09 Inspection Of Work: All materials and each part or detail of the Work are subject to inspection by the Project Engineer. Work performed or materials used by the Contractor without supervision, inspection, or written approval by an authorized Department representative may be ordered removed and replaced, at Contractor's expense, if found to be defective or noncompliant with the Contract Documents. No Work shall be preformed on Legal Holidays, Sundays or after 5:00 P.M. on week days without prior written approval from the Project Engineer.

ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 **The Contract Documents**: Delete the last sentence of this Subparagraph and substitute following sentence:

The Contract Documents include the Advertisement for Bids, Instructions to Bidders, Notice to Bidders, Proposal Form, sample forms and all portions of addenda issued prior to execution of the Contract.

1.1.7 **Instruments of Service:** Add a new sentence at the end of this Subparagraph:

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATION AND OTHER INSTRUMENTS OF SERVICE

1.5.1 Add a new sentence at the end of this Subparagraph:

This Paragraph in no way supersedes the Owner's document rights set forth in the "Engineering Services Contract" Agreement Between the Owner and the Professional.

ARTICLE 2 OWNER

2.1 GENERAL

2.1.1 Change this Subparagraph to read as follows:

The Owner, as used in these Documents, refers to the Mississippi Transportation Commission, a body Corporate of the State of Mississippi, acting by and through the duly authorized Executive Director of the Mississippi Department of Transportation for the benefit of the Department for which the Work under this Contract is being performed. The Owner is the entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner's representative, who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, is the individual who signed the Construction Contract for the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

2.2.5 Change this Subparagraph to read as follows:

After the Contract is executed by the Executive Director, the Contractor will receive free of charge two bound copies of the Project Manual (Proposal and Contract Documents) (one executed and one blank), and five full-scale copies of the Drawings and two half-

scale copies. The Contractor shall have available on the Project Site at all times one copy each of the Contract Drawings and the Project Manual (Proposal).

ARTICLE 3 CONTRACTOR

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 Change the last sentence to read as follows:

If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner and Professional shall be responsible for any resulting loss or damage.

3.18 INDEMNIFICATION

3.18.3 Add a new Subparagraph as follows:

The Contractor agrees to defend, hold harmless and indemnify the Owner against all claims or demands caused by the Contractor's acts or omissions.

ARTICLE 4 ARCHITECT

4.1 GENERAL

4.1.4 Add a new Subparagraph as follows:

The term "Architect," "Engineer," "Professional", or "Consultant" as used in these Documents refers to the Professional firm who has been directed by the Owner to design and inspect construction of this Project.

4.1.5 Add a new Subparagraph as follows:

The term "Project Engineer" as used in these Documents refers to the Mississippi Department of Transportation Executive Director's authorized representative. The term "MDOT Architect" is the representative for the MDOT Architectural Services Unit and is an advisor to the Project Engineer.

ARTICLE 5 SUBCONTRACTORS

No supplementary conditions.

Article 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

No supplementary conditions.

ARTICLE 7 CHANGES IN THE WORK

7.1 GENERAL

7.1.1 Replace the words "Change Order" with the words "Supplemental Agreement".

7.2 CHANGE ORDERS

7.2.2 Add a new Subparagraph as follows:
The maximum cost included in a Change Order (Supplemental Agreement) for profit and overhead is limited to twenty percent (20%) of the total of the actual cost for materials, labor and subcontracts. Profit and overhead include: all taxes, fees, permits, insurance, bond, job superintendent, job and home office expense. All Subcontractors shall acquiesce to the same requirements when participating in a Change Order (Supplemental Agreement).

ARTICLE 8 TIME

8.1 DEFINITIONS

8.1.1 Change this Subparagraph to read as follows:

Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Completion of the Work.

8.1.3 Change this Subparagraph to read as follows:

The Date of Completion is the date certified by the Project Engineer and approved by the Owner in accordance with Paragraph 9.8 entitled “Substantial Completion.”

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 Change this Subparagraph to read as follows:

If the Contractor is delayed at any time in the commencement or progress of the Work by any act of neglect of the Owner or Project Engineer, or by any employee or either, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or any causes beyond the Contractor’s control, or by any other causes which the Project Engineer determines may justify the delay, then the Contract time may be extended by Change Order for such reasonable time as the Engineer may determine, subject to the Owner’s approval. Any claim for loss or any delay occasioned by any separate Contractor, or Subcontractor, shall be settled between the Contractor and such other separate Contractor, or Subcontractors.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

9.3.1 Add a new sentence to the end of this Subparagraph:

The form of Application for Payment will be AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet, or a computer generated form containing similar data.

9.3.1.3 Add a new Clause to Subparagraph 9.3.1 as follows:

The Owner will retain five percent (5%) until the Work is at least fifty percent (50%) complete, on schedule, and satisfactory in the Project Engineer's opinion, at which time fifty percent (50%) of the retainage held to date shall be returned to the Contractor for distribution to the appropriate Sub-Contractors and Suppliers. Future retainage shall be withheld at the rate of two and one half percent (2-1/2%) of the amount due the Contractor on account of progress payments.

9.3.1.4 Add a new Clause to Subparagraph 9.3.1 as follows:

The Contractor must submit each month with this Application for Payment a separate letter stating that he is requesting an extension of time or that he had no need for an extension for that period of time. No payment on a monthly application will be made until the letter is received. Complete justification such as weather reports or other pertinent correspondence must be included for each day's request for extension. A Contractor's letter, or statement, will not be considered as adequate justification. The receipt of this request and data by the Owner will not be considered as Owner approval in any way.

9.3.2.1 Add a new Clause to Subparagraph 9.3.2 as follows:

Payment on materials stored at some location other than the building site, may be approved by the Project Engineer and the Owner after the Contractor has submitted the following items:

.1 An acceptable Lease Agreement between the General Contractor and the owner of the land, or building, where the materials are located.

.2 Consent of Surety, or other acceptable Bond, to cover the materials stored off-site.

.3 All Perils Insurance coverage for the full value of the materials stored off-site.

.4 A Bill of Sale from the Manufacturer to the General Contractor for the stored materials.

.5 A complete list and inventory of materials manufactured, stored and delivered to the storage site and of materials removed from the storage site and delivered to the job site.

.6 A review by the Project Engineer of the materials stored off-site prior to release of payment.

.7 Guarantee no storage costs, additional delivery fees, or subsequent costs to the Owner.

. 8 List of stored items shall be sent to the Chief Engineer for his approval prior to payment of stored materials.

9.3.2.2 Add a new Clause to Subparagraph 9.3.2 as follows:

Payment for materials stored at the building site, may be approved by the Project Engineer and the Owner after the Contractor has submitted the following items:

.1 A Bill of Sale from the Manufacturer to the General Contractor for the stored materials.

.2 List of stored items shall be sent to the Chief Engineer for his approval prior to payment of stored materials.

.3 List of stored items shall be sent to the Chief Engineer for his approval prior to payment of stored materials.

9.6 PROGRESS PAYMENTS

9.6.8 Add a new Subparagraph as follows:

The amount retained by the Contractor from each payment to each Subcontractor and material supplier will not exceed the percentage retained by the Owner from the Contractor.

9.7 FAILURE OF PAYMENT

Change this Paragraph to read as follows:

The Contractor and the Owner shall be subject to the remedies as prescribed in Section 31-5-25 of the **Mississippi Code 1972, Annotated.**

9.8 SUBSTANTIAL COMPLETION

9.8.4 Add a new sentence at the end of this Subparagraph:

Substantial Completion shall not be recognized under this Contract. The Project Engineer shall determine when the building is complete to the point it can be used for its intended purpose and occupied. This date shall be the Date of Completion. All Warranties and Extended Warranties shall use this date as the starting date of Warranty Period.

9.11 LIQUIDATED DAMAGES

9.11.1 Add a new Paragraph as follows:

Time being of the essence and a matter of material consideration thereof, a reasonable estimate in advance is established to cover losses incurred by the Owner if the project is not substantially complete on the date set forth in the Contract Documents. The Contractor and his Surety will be liable for and will pay the Owner liquidated damages for each calendar day of delay until the work is substantially complete as follows:

For More Than	To and Including	Per Calendar Day
$ 0	$ 100,000	$ 140
100,000	500,000	200
500,000	1,000,000	300
1,000,000	2,000,000	400
2,000,000	5,000,000	650
5,000,000	10,000,000	750
10,000,000	--------	1,400

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.5 Change this Subparagraph to read as follows:

The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clause 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is

responsible for Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Project Engineer and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.3 HAZARDOUS MATERIALS

10.3.2 Delete this Subparagraph in its entirety.

10.3.3 Delete this Subparagraph in its entirety.

10.3.4 Delete this Subparagraph in its entirety.

10.3.5 Delete this Subparagraph in its entirety.

10.3.6 Delete this Subparagraph in its entirety.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.5 Add a new Subparagraph as follows:

The Contractor's limits of liability shall be written for not less than the following:

.1 GENERAL LIABILITY:

Commercial General Liability
(Including XCU)

General Aggregate……..	$ 1,000,000.00	Aggregate
Products & Completed Operations……..	$ 1,000,000.00	Aggregate
Personal & Advertising Injury……..	$ 500,000.00	Per Occurrence
Bodily Injury & Property Damage…….	$ 500,000.00	Per Occurrence
Fire Damage Liability…….	$ 50,000.00	Per Fire
Medical Expense…….	$ 5,000.00	Per Person

.2 OWNERS & CONTRACTORS PROTECTIVE LIABILITY:

Bodily Injury & Property Damage…….	$ 1,000,000.00	Aggregate
Bodily Injury & Property Damage…….	$ 500,000.00	Per Occurrence

.3 AUTOMOBILE LIABILITY:

(Owned, Non-owned & Hired Vehicle

Contractor Insurance Option Number 1:

Bodily Injury & Property Damage…….	$ 500,000.00	Per Occurrence
(Combined Single Limit)		

Contractor Insurance Option Number 2:

Bodily Injury…….	$ 250,000.00	Per Person
Bodily Injury…….	$ 500,000.00	Per Accident
Property Damage……...	$ 100,000.00	Per Occurrence

.4 EXCESS LIABILITY:

(Umbrella on projects over $500,000)

Bodily Injury & Property Damage …….	$ 1,000,000.00	Aggregate
(Combined Single Limit)		

.5 WORKERS' COMPENSATION:

(As required by Statute)

EMPLOYERS' LIABILITY:

Accident	……$	100,000.00	Per Occurrence
Disease	……$	500,000.00	Policy Limit
Disease	……$	100,000.00	Per Employee

.6 PROPERTY INSURANCE:

Builder's Risk……$ Equal to Value of Work
Or
Installation Floater……$ Equal to Value of Work

11.1.6 Add a new Subparagraph as follows:

Furnish one (1) copy of the Standard Construction Contract Certificate of Insurance Form for each copy of the Standard Form of Agreement Between Owner and Contractor specifically setting forth evidence of all coverage required by Subparagraphs 11.1.1, 11.1.2 and 11.1.3. Furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

11.1.7 Add a new Subparagraph as follows:

If the coverages are provided on a claims-made basis, the policy date or retroactive date shall predate the Contract: the termination date, or the policy, or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment.

11.2 OWNER'S LIABILITY INSURANCE

Change this Paragraph to read as follows:

The Contractor shall purchase and maintain such insurance as will protect the Owner from his contingent liability to others for damages because of bodily injury, including death, and property damage, which may arise from operations under this Contract and other liability for damages which the Contractor is required to insure under any provision of this Contract. Certificate of this insurance will be filed with the Owner and will be the same limits set forth in 11.1.4.

11.3 PROPERTY INSURANCE

11.3.1 Change the first line in this Subparagraph to read as follows:

The Contractor shall purchase…

11.3.1.2 Delete this Clause under Subparagraph 11.3.1 in its entirety.

11.3.1.3 Change the following Clause in Subparagraph 11.3.1.3 to read as follows:

If the property insurance requires deductibles, the Contractor shall pay costs not covered because of such deductibles.

11.3.2 Delete this Subparagraph in its entirety.

11.3.3 Delete this Subparagraph in its entirety.

11.3.4 Delete this Subparagraph in its entirety.

11.3.5 Delete this Subparagraph in its entirety.

11.3.6 Delete this Subparagraph in its entirety.

11.3.10 Change this Subparagraph to read as follows:

The Owner as fiduciary shall have power to adjust and settle a loss with Insurers unless one of the parties in interest shall object in writing within five (5) days after occurrence of loss.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

No supplementary conditions.

ARTICLE 13 MISCELLANEOUS PROVISIONS

No supplementary conditions.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

No supplementary conditions.

ARTICLE 15 CLAIMS AND DISPUTES

15.3 MEDIATION

15.3.1 Delete this Subparagraph in its entirety.

15.3.2 Delete this Subparagraph in its entirety.

15.3.3 Delete this Subparagraph in its entirety.

15.4 ARBITRATION

15.4.1 Delete this Subparagraph in its entirety.

15.4.1.1 Delete this Clause in its entirety.

15.4.2 Delete this Subparagraph in its entirety.

15.4.3 Delete this Subparagraph in its entirety.

15.4.4 Delete this Subparagraph in its entirety.

15.4.4.1 Delete this Clause in its entirety.

15.4.4.2 Delete this Clause in its entirety.

15.4.4.3 Delete this Clause in its entirety.

15.5 Add a new Paragraph as follows:

ARBITRATION PROCEDURES FOR THE MISSISSIPPI TRANSPORTATION COMMISSION

All matters of dispute arising out of any agreement with the Mississippi Transportation Commission for planning, design, engineering, construction, erection, repair, or alteration of any building, structure, fixture, road, highway, utility or any part thereof, or any agreement with the Mississippi Transportation Commission for architectural, engineering, surveying, planning, and related professional services which provides for mediation or arbitration, shall comply with the following course for resolution. No arbitration hearing shall be granted on any claim in excess of One Hundred Thousand Dollars ($100,000.00).

15.5.1 Add a new Subparagraph as follows:

CONDITIONS PRECEDENT TO ARBITRATION

.1 The aggrieved party must first notify opposing party in writing in detail of the matter(s) in dispute, the amount involved and the remedy sought. Such writing shall include copies of any documents, writings, plans, or other matter pertinent to the resolution of the dispute. The Chief Engineer of the Mississippi Department of Transportation, or his authorized representative, and a principal of the opposing party shall be the proper parties for such notice and shall be active parties in any subsequent dispute resolution.

.2 If the dispute cannot be satisfactorily resolved, within thirty (30) days of the complaint being rejected in writing by either party, notice by certified mail shall be given to the Project Engineer. A copy of the notice shall be sent by certified mail to the opposing party. Such notice shall be in writing setting forth in detail the matter(s) in dispute, the amount involved, the remedy sought and state that informal resolution between the parties cannot be reached. Such writing shall include copies of any documents, writings, plans, or other matter pertinent to the resolution of the dispute. Opposing party shall have the opportunity to set forth in writing a rebuttal with pertinent documents attached. At the sole discretion of the Project Engineer, oral testimony may be had on the matter.

15.5.2 Add a new Subparagraph as follows:

REQUESTS FOR ARBITRATION: Within thirty (30) days of a claim being rejected in writing by the Project Engineer, either party may request arbitration. Notices for requests for arbitration shall be made in writing to the Chief Engineer of the Mississippi Department of Transportation, P. O. Box 1850, Jackson, Mississippi 39215-1850. Such notice shall set forth in detail the matter(s) in dispute, the amount involved, and the remedy sought. A copy of the request shall be mailed to the opposite party. The party requesting arbitration must deposit the sum of two hundred dollars ($200.00) with its request as a deposit against costs incurred by the arbitrators. Each party will be notified in writing in any manner provided by law of certified mail not less than twenty (20) days before the hearing of the date, time and place for the hearing. Appearance at the hearing waives a party's right to notice.

15.5.3 Add a new Subparagraph as follows:

SELECTION OF ARBITRATORS: Upon request for arbitration, a panel of three (3) arbitrators shall be chosen. The Chief Engineer of the Mississippi Department of Transportation shall appoint one (1) member. One (1) member shall be appointed by the

Executive Director of a professional or trade association that represents interests similar to that of the non-state party. The first two shall appoint the third member.

15.5.4 Add a new Subparagraph as follows:

HEARINGS: All hearings shall be open to the public. All hearings will be held in Jackson, Mississippi, unless the parties mutually agree to another location. The hearings shall be conducted as prescribed by **Mississippi Code 1972, Annotated**, Sections 11-15-113, 11-15-115, and 11-15-117. A full and complete record of all proceedings shall be taken by a certified court reporter. The scheduling and cost of retaining the court reporter shall be the responsibility of the party requesting arbitration. The costs of transcription of the record shall be the responsibility of the party requesting such transcript. No arbitration hearing shall be held without a certified court reporter. Deliberations of the arbitrators shall not be part of the record.

15.5.5 Add a new Subparagraph as follows:

AWARDS: Awards shall be made in writing and signed by the arbitrators joining in the award. A copy of the award shall be delivered to the parties by certified mail.

15.5.6 Add a new Subparagraph as follows:

FEES AND EXPENSES: Reasonable fees and expenses, excluding counsel fees, incurred in the conduct of the arbitration shall be at the discretion of the Arbitrator except each party shall bear its own attorney's fees and costs of expert witnesses.

15.5.7 Add a new Subparagraph as follows:

MODIFICATIONS, CONFIRMATIONS, AND APPEALS: All modifications, confirmations and appeals shall be as prescribed by **Mississippi Code 1972, Annotated**, Section 11-15-123 et seq. All awards shall be reduced to judgment and satisfied in the same manner other judgments against the State are satisfied.

15.5.8 Add a new Subparagraph as follows:

SECRETARY FOR THE ARBITRATORS: All notices, requests, or other correspondence intended for the arbitrators shall be sent to the Chief Engineer, Mississippi Department of Transportation, P. O. Box 1850, Jackson, Mississippi 39215-1850.

END OF SECTION

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SECTION 00 91 13 ADDENDA

DATE: **April 4, 2011**

PROJECT: **SHOP BUILDING FOR MATERIALS LABORATORY IN JACKSON, HINDS COUNTY, MISSISSIPPI**

PROJECT NUMBERS: **BWO-9718-25(001) 502350**
LWO-9023-25(002) 502350

PART 1 GENERAL

1.01 DESCRIPTION

A. Addenda issued on this Project will be included in Section 00 91 13 and become part of the Standard Form of the Agreement Between the Owner and the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 10 00 SUMMARY

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Work covered by the Contract Documents shall be provided by one (1) General Contractor as one (1) Contract to improve the Mississippi Department of Transportation site to construct a Shop Building for Materials Laboratory in Jackson, Hinds County, Mississippi. A separate Lump Sum as described in these Specifications and Drawings are to be given to Special Provision 907-242-25 and Pay Item 907-242-A006.

B. Time of Completion: The completion of this Work is to be on or before the time indicated on the Owner and Contractor Agreement.

C. Contractor's Duties:

1. Except as specifically noted, provide and pay for:
   a. Labor, materials, equipment.
   b. Tools, construction equipment, and machinery.
   c. Other facilities and services necessary for proper execution and completion of the Work.
2. Pay legally required sales, consumer, use, payroll, privilege and other taxes.
3. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids:
   a. Permits
   b. Government Fees
   c. Licenses
4. Give required notices.
5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities that bear on performance of Work.
6. Promptly submit written notice to Project Engineer of observed variance of Contract Documents from legal requirements. Appropriate modifications to Contract Documents will adjust necessary changes. Assume responsibility for Work known to be contrary to such requirements, without notice.
7. Enforce strict discipline and good order among employees. Do not employ on Work, unfit persons or persons not skilled in assigned task.
8. Schedule of Values: Submit 8 copies to the MDOT Architectural Services Unit a Schedule of Values as described in Section 01 29 73 of these Specifications. This submittal will be recorded as submittal number one for this Project. When this submittal is approved, a copy will be transmitted to Construction Administration to be used to review and compare to amounts submitted on the CAD-720 form. Other copies will be kept by Architectural Services Unit and distributed to Project Engineer, MDOT Consultants, and Contractor.
9. Sub-Contractors List: Submit 8 copies of a list, acceptable to the MDOT, of all subcontractors to be used on the Project within seven (7) days after written notice of Contract award by the MDOT. The list shall include the Firm’s name, contact person, street address, e-mail address, telephone and fax numbers. Submit original to Contract Administration Division and one copy to the Project Engineer and to the MDOT Architect CAD-720 form - REQUEST FOR PERMISSION TO SUBCONTRACT for each subcontractor before they are allowed to perform any Work.

10. Coordination: The Contractor is responsible for the coordination of the total Project. All subcontractors will cooperate with the Contractor so as to facilitate the general progress of the Work. Each trade shall afford all other trades every reasonable opportunity for the installation of their Work. Refer to Section 01 31 00 Project Management & Coordination.

1.02 CONTRACTOR'S USE OF PREMISES

A. Confine operations at the site to areas permitted by:

1. Law
2. Ordinances
3. Permits
4. Contract Documents
5. Owner

B. Do not unreasonably encumber site with materials or equipment.

C. Do not load structure with weight that will endanger structure.

D. Assume full responsibility for protection and safekeeping of products stored on premises.

E. Move any stored products which interfere with operations of MDOT or other Contractors.

F. Obtain and pay for use of additional storage of work areas needed for operations.

G. Limit use of site for work and storage to the area indicated on the Drawings.

1.03 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Groups, Subgroups, Divisions and Sections using CSI/CSC's "MasterFormat" 2004 Edition numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in Divisions 02 through 49 in the Specifications.

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 and other 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 00 CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SCOPE

A. This Section describes the procedures for processing Change Orders (Supplemental Agreements) by the Project Engineer and the Contractor.

1.02 CHANGE ORDER PROCEDURES

A. Change Proposed by the Project Engineer: The Project Engineer may issue a Proposal Request to the Contractor which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications and a change in Contract Time for executing the change. The Contractor shall prepare and submit an estimate within 10 days.

B. Change Proposed by the Contractor: The Contractor may propose a change by submitting a request for change to the Project Engineer, describing the proposed change and it's full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01 62 14 - Product Options and Substitution Procedures.

C. Contractor's Documentation:

1. Maintain detailed records of Work completed on a time and material basis. Provide full information required for evaluation of proposed changes, and substantiate costs of changes in the Work.
2. Document each quotation for a change in cost or time with sufficient data allowing evaluation of the quotation.
3. On request, provide additional data to support computations:

    a. Quantities of products, labor, and equipment.
    b. Taxes, insurance and bonds.
    c. Overhead and profit.
    d. Justification for any change in Contract Time.
    e. Credit for deletions from Contract, similarly documented.

4. Support each claim for additional costs, and for work completed on a time and material basis, with additional information:

    a. Origin and date of claim.
    b. Dates and time work was performed and by whom.
    c. Time records and wage rates paid.
    d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

D. Construction Change Directive: The Project Engineer may issue a document, approved by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order (Supplemental Agreement). The document will describe changes in the Work, and will designate method of determining any change in the Contract Sum or Contract Time. The change in Work will be promptly executed.

E. Format: The Project Engineer will prepare 5 originals of the Change Order (Supplemental Agreement) using the Mississippi Department of Transportation's Change Order (Supplemental Agreement) Form.

F. Types of Change Orders (Supplemental Agreements):

1. Stipulated Sum Change Orders: Based on Proposal Request and Contractor's fixed price quotation, or Contractor's request for a Change Order (Supplemental Agreement) as approved by the Project Engineer and the MDOT Architect.
2. Unit Price Change Order: For pre-determined unit prices and quantities, the Change Order (Supplemental Agreement) will be executed on a fixed unit price basis. For unit costs or quantities of units of work, which are not pre-determined, execute Work under a Construction Change Directive. Changes in Contract Sum or Contract Time will be computed as specified for Time and Material Change Order (Supplemental Agreement).
3. Time and Material Change Order (Supplemental Agreement): Submit itemized account and supporting data after completion of change, within time limits indicated in the Standard Form of Agreement Between the Owner and the Contractor. The Project Engineer will determine the change allowable in Contract Sum and Contract Time as provided in the Contract Documents. The Contractor shall maintain detailed records of Work accomplished on Time and Material basis and shall provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

G. Execution of Change Order (Supplemental Agreement): The Project Engineer will issue Change Orders (Supplemental Agreements) for signatures of parties as provided in the Standard Form of Agreement Between the Owner and the Contractor. Final execution of all Change Orders (Supplemental Agreements) requires approval by the Owner.

H. Correlation of Contractor Submittals: The Contractor shall promptly revise Schedule of Values and the Application for Payment forms to record each authorized Change Order (Supplemental Agreement)as a separate line item and adjust the Contract Sum. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of Work affected by the change and resubmit. Promptly enter changes in Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 METHOD OF MEASUREMENT

A. The method of measurement and payment shall conform to the applicable provisions of Article 9 of the AIA Document A201-2007 General Conditions of the Contract for Construction.

1.02 APPLICATION FOR PAYMENT

A. Format:

1. Applications for Payments will be prepared on AIA forms G702-Application and Certificate for payment and G703-Continuation Sheet; or, a computer generated form containing similar data may be used.

B. Preparation of Application:

1. Present required information in type written form.
2. Execute certification by signature of authorized officer.
3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original Item of Work.
5. Prepare Application for Final Payment as specified in Section 01 77 00-Closeout Procedures.

C. Submittal Procedures:

1. Submit 3 copies of each Application for Payment to the Project Engineer and one copy to the MDOT Architect.
2. Submit an updated construction schedule with each Application for Payment as described in Section 01 32 00-Construction Progress Documentation.
3. Submit request for payment at intervals agreed upon by the Project Engineer, Owner, and Contractor.
4. Submit requests to the Project Engineer at agreed upon times, or as may be directed otherwise.

D. Substantiating Data:

1. Submit data justifying dollar amounts in question when such information is needed.
2. Provide one copy of the data with a cover letter for each submittal.
3. Indicate the Application number, date and line item number and description.

1.03 STATEMENTS AND PAYROLLS

A. The submission by the Contractor of the actual weekly payrolls showing all employees, hours worked, hourly rates, overtime hours, etc., or copies thereof, is not required to be turned in. However, each Contractor and Subcontractor shall preserve weekly payroll records for a period of three years from the date of Contract completion.

B. All Contractor personnel working at the project site will be paid unconditionally and not less often than once a week without subsequent deduction or rebate on any account, except such payroll deductions as are permitted by regulations, the full amounts of wages and bona fide fringe benefits due at time of payment.

C. The payroll records shall contain the name, with an individually identifying number for each employee, classification, rate of pay, daily and weekly number of hours worked, itemized deductions and actual wages paid to each employee.

D. Upon request, the Contractor will make payroll records available at the project site for inspection by the Department Compliance Officer or authorized representative and will permit such officer or representative to interview employees on the job during working hours.

E. The Contractor and Subcontractors shall submit Form CAD-880, “Weekly Summary of Wage Rates”, each week to the Project Engineer. The forms may be obtained from the Contract Compliance Officer, Contract Administration Division, Mississippi Department of Transportation, Jackson, Mississippi. Custom forms, approved by Contract Administration Division, may be used in lieu of CAD forms.

F. The Contractor shall make all efforts necessary to submit this information to the Project Engineer in a timely manner. The Engineer will have the authority to suspend the work wholly or in part and to withhold payments because of the Contractor's failure to submit the required information. Submission of forms and payrolls shall be current through the first week of the estimate period in order for the Project Engineer to process an estimate.

1.04 BASIS OF PAYMENT

A. This Work will be paid for by Contract Sum for the construction of the Shop Building for Materials Laboratory in Jackson, Hinds County, Mississippi. The Contract Sum shall be full compensation for all site work, for furnishing all materials, and all other Work and effort of whatever nature in the construction of the building, installation of underground and other equipment, and final clean-up of the area. It shall also be complete compensation for all equipment, tools, labor, and incidentals necessary to complete the Work.

B. Payment for this Special Provision will be made under:

907-242-A006	Lump Sum
TOTAL SPECIAL PROVISION SUM	**LUMP SUM**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 73 SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Submit [8] copies of the Schedule of Values to the MDOT Architect, with a copy of the Transmittal Letter to the Project Engineer, at least 10 days prior to submitting first Application for Payment. Upon Project Engineer's request, support the values given with data substantiating their correctness. Payment for materials stored on site will be limited to those listed in Schedule of Unit Material Values (refer to Article 9 of the Supplementary Conditions for requirements). Use Schedule of Values only as basis for contractor's Application for Payment.

B. The [10] copies of the Schedule of Values will be reviewed as Submittal #1. A copy of this submittal will be reviewed by the Architect and Mechanical / Electrical Consultants. One copy will be retained by MDOT Architectural Services, one by Architect, Structural Engineer, Civil Consultant, Mechanical / Electrical Consultants, one sent to Contract Administration for use in reviewing requests for Permission to Sub-Contract (CAD-720 Form), one sent to the Project Engineer, and two returned to the Contractor. If any extra copies are needed for the Contractor, adjust number submitted.

C. Form of Submittal: Submit typewritten Schedule of Values on AIA Document G703-1992, using Table of Contents of this Specification as basis for format for listing costs of Work for Sections under Divisions 02 - 49. Identify each line item with number and title as listed in Table of Contents of this Specification.

D. Preparing Schedule of Values:

1. Itemize separate line item costs for each of the following general cost items: Performance and Payment Bonds, field supervision and layout, Contingency Allowance, temporary facilities and controls, and closeout documents.
2. Itemize separate line item cost for Work required by each Section of this specification. Breakdown installed cost with overhead and profit.
3. For each line item, which has installed value of more than $20,000, break down costs to list major products for operations under each item; rounding figures to nearest dollar. Make sum of total costs of all items listed in schedule equal to total Contract Sum.

E. Preparing Schedule of Unit Material Values:

1. Submit separate schedule of unit prices for materials to be stored on which progress payments will be made. Make form of submittal parallel to Schedule of Values with each line item identified same as line item in Schedule of Values. Include in unit prices only: Cost of material, delivery and unloading site, and sales tax.
2. Make sure unit prices (if required) multiplied by quantities equal material cost of that item in Schedule of Values.

F. Review and Re-submittal: After Project Engineer / MDOT Architect's review, if requested, revise and resubmit schedule in same manner

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00 PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Scope: To set forth procedures, conditions and responsibility for coordination of the total project.

B. Project Coordinator: The General Contractor shall designate one individual as Project Coordinator (Superintendent), as referred to in the General Conditions. Prior to beginning Work his name, qualifications and address shall be submitted, in writing, to the MDOT Executive Director with copies to the Construction Engineer, Contract Administration Engineer, District Engineer, Project Engineer and MDOT Architect. Upon approval, he will remain until the Project is completed and cannot be removed during construction without just cause and without the written consent of the Project Engineer.

1.02 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.03 SUBMITTALS

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.04 DUTIES OF PROJECT COORDINATOR (SUPERINTENDENT)

A. General:

1. Coordination: Coordinate the work of all subcontractors and material suppliers.
2. Supervision: Supervise the activities of every phase of Work taking place on the project.
3. Contractor's Daily Job Diary: Submit copy of daily job dairy to Project Engineer and MDOT Architect each Monday for previous week.
4. Electrical: Take special care to coordinate and supervise the Work of electrical and other subcontractors.
5. Communication: Establish lines of authority and communication at the job site.
6. Location: The Project Coordinator (Superintendent) must be present on the job site at all times while work is in progress. Superintendent shall advise Project Engineer of an intended absence from the work and designate a person to be in charge of the Work during such absence.
7. Permits: Assist in obtaining building and special permits required for construction.

B. Interpretations of Contract Documents

1. Consultation: Consult with Project Engineer to obtain interpretations.

2. Assistance: Assist in resolution of any questions.
3. Transmission: Transmit written interpretations to concerned parties.

C. Cessation of Work: Stop all Work not in accordance with the requirements of the Contract Documents.

D. Division One: Coordinate and assist in the preparation of all requirements of Division One and specifically as follows:

1. Enforce all safety requirements.
2. Schedule of Values: Assist in preparation and be knowledgeable of each entry in the Schedule of Values.
3. Cutting and Patching: Supervise and control all cutting and patching of other trades work.
4. Project Meetings: Schedule with Project Engineer's approval and attend all project meetings.
5. Construction Schedules: Prepare and submit all construction schedules. Supervise Work to monitor compliance with schedules.
6. Shop Drawings, Product Data and Samples: Administer the processing of all submittals required by the Project Manual.
7. Testing: Coordinate all required testing.
8. Temporary Facilities and Controls: Allocate, maintain and monitor all temporary facilities.
9. Substitutions and Product Options: Administer the processing of all substitutions.
10. Cleaning: Direct and execute a continuing (daily) cleaning program throughout construction, requiring each trade to dispose of their debris.
11. Project Closeout: Collect and present all closeout documents to the Project Engineer.
12. Project Record Documents: Maintain up-to-date Project Record Documents.

E. Changes: Recommend and assist in the preparation of requests to the Project Engineer for any changes in the Contract.

F. Application for Payment: Assist in the preparation and be knowledgeable of each entry in the Application and Certificate for Payment.

1.05 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of Mechanical and Electrical Work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy, if required.

E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.06 SUBCONTRACTOR'S DUTIES

A. The Subcontractor is responsible to coordinate and supervise his employees in the Work accomplished under his part of the Contract.

B. Schedules: Conduct Work to assure compliance with construction schedules.

C. Suppliers: Transmit all instructions to his material suppliers.

D. Cooperation: Cooperate with the Project Coordinator and other subcontractors.

1.07 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: CSI Form 13.2A

1. Identify each page of attachments with the RFI number and sequential page number.

D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log the first week of each month. Use CSI Log Form 13.2B. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 19 PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provisions for and procedures related to the required Project Meetings which include, but not limited to, the following for each Project Phase:

1. Pre-Construction Meeting.
2. Periodic Progress Meetings.

1.02 MEETINGS

A. Purpose of Meetings: Project Meetings shall be held for the following reasons:

1. To establish an understanding of what is expected from everyone involved.
2. To enable an orderly Project review during the progress of the Work.
3. To provide for systematic discussion of problems and effect remedies and clarifications.
4. To coordinate the Work.
5. To review installation procedures and schedules.

1.03 SCHEDULING AND ADMINISTRATION

A. The Project Engineer shall schedule and preside over all meetings throughout the progress of the Work. Duties include the following:

1. Review, modify / approve minutes of the previous meeting.
2. Discuss items that have been done the previous month and anticipated work to be done within the next month.
3. Review Contractor's Pay Request and resolve questions or conflicts with Construction Documents.

B. The Contractor shall attend and administer all meetings throughout the progress of the Work. Duties include the following:

1. Preparation of agenda for meetings
2. Distribution of agenda and written notice 7 days in advance of date for each regularly scheduled meeting.
3. Make physical arrangements for meetings.
4. Record the minutes which shall include list of all participants and all significant proceedings and, in particular, all decisions, agreements, clarifications, and other data related to Project cost, time, and modifications.
5. Distribute copies of minutes within 7 calendar days to all parties affected by decisions made at the meeting.
6. Follow-up unresolved matters discussed at meetings and promptly effect final resolution, especially for work in progress. Advise all effected parties of result and include report of activities in next scheduled meeting.

C. Representatives of Contractor's, Subcontractor's, and Supplier's attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

D. Consultants may attend meetings to ascertain work is expedited consistent with Contract Documents and construction schedules.

1.04 PRE-CONSTRUCTION MEETING

A. Schedule: Schedule Pre-Construction Meeting within 10 days after Notice to Proceed.

B. Location: A central site, convenient for all parties, designated by the Contractor and approved by the Project Engineer and the MDOT Architect.

C. Attendance: Attending shall be the Project Engineer and MDOT representatives associated with the Project, the MDOT Architect (if requested by the District), his Consultants, the General Contractor, all major Subcontractors, and any representatives of governmental or other regulatory agencies as required.

D. Minimum Agenda:

1. Distribute and discuss construction schedule prepared by Contractor.
2. Review critical Work sequencing.
3. Designate responsibilities.
4. State procedures for submittals.
5. State procedures for maintaining record documents.
6. State procedures for change orders.
7. State procedures for application of payment.
8. Coordinate use of premises, including office and storage areas.
9. List Owner's requirements.
10. Show clear understanding of Security.
11. Show clear understanding of Housekeeping procedures.

1.05 PROGRESS MEETINGS

A. Schedule: Progress Meetings will be scheduled monthly. The Project Engineer will cancel the meeting with at least 48 hours notice if a meeting is not necessary for any particular month.

B. Place of Project Meetings: Contractor’s Field Office except as otherwise agreed.

C. Attendance: Attending shall be the Project Engineer or his representative and MDOT representatives associated with the Project, the MDOT Architect or his representative (if requested by the District) and his Consultants, the General Contractor, and all Subcontractors as pertinent to the agenda.

D. Minimum Agenda:

1. Review, modify / approve minutes of the previous meeting.
2. Review work progress since last meeting.
3. Note field observations, problems and decisions.
4. Identify problems that impede planned progress.
5. Review off-site fabrication problems.
6. Revise construction schedule as indicated.
7. Plan progress during the next work period.
8. Review submittal schedules; expedite and modify as required.
9. Review proposed changes,
10. Review Request for Payment.
11. Complete other current business.

PART 2 - PRODUCTS & PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Provide projected Construction Schedules for entire Work and revise monthly to show progress through the pay period. The following is a minimum requirement and other type schedules are acceptable with Owner's approval.

B. Form of Schedules: Prepare in form of horizontal bar chart.

1. Provide separate horizontal bar column for each trade or operation.
2. Order: Table of Contents of Specifications.
3. Identify each column by major Specification section number.
4. Horizontal Time Scale: Identify first work day of each week.
5. Scale and Spacing: To allow space for updating.

C. Content of Schedules:

1. Provide complete sequence of construction by activity.
2. Indicate dates for beginning and completion of each stage of construction.
3. Identify Work of logically grouped activities.
4. Show projected percentage of completion for each item of Work as of first day of each month.

D. Updating:

1. Show all changes occurring since previous submission of updated schedule.
2. Indicate progress of each activity and completion dates.

E. Submittals:

1. Submit initial schedules to the Project Engineer / MDOT Architect within 15 days after date of Notice to Proceed.
2. Submit to the Project Engineer / MDOT Architect, periodically updated schedules accurately depicting progress to first day of each month.
3. Submit 2 copies, one to be retained by the Project Engineer and the other forwarded to the MDOT Architect.

F. If the Contractor is required to produce two revised construction schedules because of lack of progress in the Work, the Owner will notify the Contractor's surety.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00 SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Scope: Submit to the MDOT Architectural Services Unit shop drawings, product data, and samples required by Specification Sections. Faxed submittals WILL NOT be accepted. DO NOT submit Material Safety Data Sheets for approval. Refer to Section 01 62 14 – Product Options and Substitution Procedures, for requirements concerning products that will be acceptable on this Project.

B. Shop Drawings: Original (LEGIBLE) drawings (NO FAXED COPIES) prepared by Contractor, subcontractor, supplier or distributor which illustrates actual portions of the Work; showing fabrication, layout, setting or erection details. REPRODUCTIONS of the Contract Drawings WILL NOT be acceptable. Minimum requirements for shop drawings shall include the following:

1. Prepared by a qualified detailer.
2. IDENTIFY DETAILS BY REFERENCE TO SHEET AND DETAIL NUMBERS SHOWN ON CONTRACT DRAWINGS.
3. Minimum sheet size: 8-1/2 inches by 11 inches.
4. Shop drawings shall be stamped and signed by the Contractor certifying accuracy, completeness and COMPLIANCE with Contract requirements PRIOR TO SUBMITTING to the MDOT Architectural Services Unit.

C. Product Data: Minimum information (NO FAXED COPIES) submitted shall include the following:

1. Manufacturer's standard schematic drawings: Modify drawings to delete information that is not applicable to the Project. Supplement standard information to provide additional information applicable to Project.
2. Manufacturer’s catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data: CLEARLY MARK each copy to identify pertinent materials, products or models. Show dimensions and clearances required. Show performance characteristics and capacities, wiring diagrams and controls.
3. Product Data shall be stamped and signed by the Contractor certifying accuracy, completeness and COMPLIANCE with contract requirements PRIOR TO SUBMITTING to the MDOT Architectural Services Unit.

D. Samples: Provide physical examples to illustrate materials, equipment or workmanship and to establish standards by which completed Work is judged.

1. Provide two copies each of sufficient size and quantity to clearly illustrate functional characteristics of products or material with integrally related parts and attachment devices and full range of color samples.
2. Samples remain the property of the Architectural Services Unit until completion of construction of the Project.
3. Samples (except for color charts/samples) will not be required when specified product is submitted.
4. If a specified product color is discontinued, Contractor shall notify Project Engineer promptly to determine if it affects other color selections.

E. Field Samples and Mock-Ups: Erect on Project Site at location acceptable to Project Engineer.

1. Construct each sample or mock-up complete, including Work of all trades required in the finished Work. Field Samples are used to determine standards in materials, color, texture, workmanship, and overall appearance.
2. Work shall not be allowed using these materials until the mock-up is approved.
3. The mock-up shall not be destroyed, until after the Work it represents is finished, without permission of the Project Engineer. This mock-up shall be used as a standard to compare to the Work it represents for color, craftsmanship, overall appearance, and how the different materials make up the whole system.

F. Contractor Responsibilities:

1. Review shop drawings, product data, and samples prior to submission.
2. Verify field measurements, construction criteria, catalog numbers and other data.
3. Coordinate each submittal with requirements of Work and Contract Documents.
4. Contractor's responsibility for errors and omissions in submittals is not relieved by MDOT Architect's / Consultant's review of submittals.
5. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by review of submittals unless written acceptance of specific deviations is given.
6. Notify the Project Engineer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents.
7. Do not order materials or begin Work requiring submittals until the return of submittals bearing MDOT Architect / Consultant's stamp and initials indicating review.
8. After MDOT Architect / Consultant's review, distribute copies.

G. Submission Requirements:

1. Schedule submission with ample time given to review submittals prior to being needed.
2. Submit Nine (9) COPIES of shop drawings and product data with additional number of copies, if required, by Contractor for distribution.
3. Partial submittals are NOT ACCEPTABLE, will be considered non-responsive, and will be returned without review.
4. Submit number of samples specified in each Specification Section.
5. Accompany submittals with transmittal letter, containing data, project title and number; Contractor's name and address; the number of each Shop Drawings, product data and samples submitted; notification of deviations from Contract Documents; and other pertinent data. Submittals shall be sent to MDOT Architect for review or distribution to Consultants, with copy of Transmittal Letter sent to Project Engineer.
6. Each copy of submittal shall include a cover page with the following requirements:
   a. Date and revision dates.
   b. Project title and number.
   c. The names of Project Engineer, Contractor, Supplier, Manufacturer, and separate detailer, when pertinent.
   d. Identification of product or material.
   e. Relation to adjacent structure or materials and COMPLETE dimensions.
   f. Field dimensions, clearly identified as such.
   g. SPECIFICATION SECTION NUMBER.
   h. Applicable standards such as ASTM Number or Federal Specification.

i. A blank space, 2 inches by 3 inches for the Reviewer's stamp.
j. Identification to deviations from Contract Documents.
k. Contractor's stamp, initialed or signed, certifying the review of submittal, verification of field measurements, and compliance with Contract Documents.

H. Resubmission Requirements:

1. Shop Drawings: Revise initial Drawings as required and resubmit as specified for initial submittal. Indicate on Drawings, all changes that have been made other than those required by the Reviewer.
2. Product Data and Samples: Submit new data and samples as required for initial submittal.

I. Distribution of Submittals after Review:

1. Distribute copies of Shop Drawings and product data which carry MDOT Architect's / Consultant's stamp to: Project Engineer's File, Architectural Services Unit File, Electrical / Mechanical / Structural Engineer's File (as required), Materials' File (if concrete), Contractor's File, Job Site File, and Subcontractor, Supplier and/or Fabricator as necessary.
2. Distribute samples as directed. The Project Engineer, MDOT Architect and Consultant (as required) shall retain one of each.

J. MDOT Architect / Consultants' Duties:

1. Review submittals with reasonable promptness.
2. Review for design concept of Project and information given in Contract Documents.
3. Review of separate item does not constitute review of an assembly in which item functions.
4. Affix stamp and initial, or signature, certifying the review of submittal.
5. Return submittals to the Architectural Services Unit, which will retain one copy and forward one copy to the Project Engineer, one copy to the Materials Engineer (if concrete), and the remainder to the Contractor.
6. Retain one copy of reviewed submittals.

K. Delays attributable to untimely submittals, submittals not approved, or time taken to resubmit WILL NOT serve as a basis for a Contract Time extension.

L. Acceptance of submittal items will not preclude rejection of these items upon discovery of defects in them prior to final acceptance of completed Work.

M. After an item has been accepted, no change in brand, make, manufacturer's catalog number, or characteristics will be considered unless:

1. Satisfactory written evidence is presented to and approved by the Project Engineer, that manufacturer cannot make scheduled delivery of accepted item, or;
2. Item delivered has been rejected and substitution of a suitable item is an urgent necessity, or;
4. Other conditions became apparent which indicates acceptance of such substitute item to be in the best interest of the Owner.

PART 2 - PRODUCTS & PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 42 19 REFERENCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Contract Definitions.

B. Identification and purpose of Reference Standards.

C. Administrative procedures and responsibility for the use of Reference Standards..

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. “Reviewed”: The term “Reviewed”, when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The terms “provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Using a term such as "carpentry" does not imply that accredited or unionized individuals of a corresponding generic name, such as “carpenter”, must perform certain construction activities. It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 IDENTIFICATION AND PURPOSE

A. Identification: Throughout the Contract Documents are references to nationally known and recognized Codes, Reference Standards, Reference Specifications, and similar documents that are published by Regulatory Agencies, Trade and Manufacturing Associations and Societies, Testing Agencies and others. References also include certain Project Documents or designated portions.

B. Purpose: All named and otherwise identified “Reference Standards” are “by reference” hereby incorporated into these Specifications as though fully written and hereby serve to establish specific requirements and pertinent characteristics for materials and workmanship as well as methods for testing / reporting on compliance thereto.

1.04 PROCEDURES AND RESPONSIBILITIES

A. Compliance with Laws and Codes of governmental agencies having jurisdiction shall be mandatory and take precedence over the requirements of all other Reference Standards. For products or workmanship specified by Associations, Trade, or Federal Standards, comply with the requirements of the standard, except when supplemented instructions indicate a more rigid standard and / or define more precise requirements. Should specified reference standards conflict with regulatory requirements or the Contract Documents, request Architect’s clarification before proceeding.

B. The Contractor (including any and all Parties furnishing and / or installing any portion of The Work) shall be familiar with the indicated codes and standards. It shall be the Contractor’s responsibility to verify the detailed requirements of the specifically named codes and standards and to verify (and provide written certification, when required) that the items procured for use in this Work (and their installation, as applicable) meet or exceed the specified requirements.

C. When date of Reference Document is not specified, conform to latest edition of said Document except when earlier editions are specifically required by Codes.

D. The contractual relationship of the Parties to the Contract shall not be altered from the requirements of the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 43 00 QUALITY ASSURANCE

PART 1 - GENERAL

1.01 WORK QUALITY

A. Shop and field work shall be performed by mechanics, craftspersons, artisans, and workers skilled and experienced in the fabrication and installation/application of the work involved. The Work of this Project shall be performed in accordance with the Drawings, reviewed and approved shop drawings, and these Specifications. Quality of work shall conform to the highest established standards and practices of the various trades involved.

B. All work shall be erected and installed plumb, level, square, and true, or true to indicated angle, and in proper alignment and relationship to the work of other trades. Finished work shall be free from defects and damage.

C. Nothing specified in these Specifications shall be construed as relieving the Contractor of any responsibility for the quality of the finished work. Surfaces on which specified finishes are to be applied shall be in proper condition in every respect for superior finished work and long life without defects.

D. The Contractor's performance of the work hereunder shall be to the satisfaction of the Architect. The Architect reserves the right to reject materials and work quality which are not considered to be up to the accepted high standards of the various trades involved. Such inferior material or work quality shall be repaired or replaced, as directed by the Architect, at no additional cost to the Owner.

1.02 MANUFACTURERS' SPECIFICATIONS AND INSTRUCTIONS

A. Unless otherwise indicated or specified, manufactured materials, products, processes, equipment, systems, assemblies, and the like shall be erected, installed, or applied in accordance with the manufacturers' instructions, directions, or specifications. Said erection, installation, or application shall be in accordance with printed instructions furnished by the manufacturer of the material or equipment concerned for use under conditions similar to those at the jobsite. Two copies of such instructions shall be furnished to the Architect, and the Architect's acceptance therefore shall be obtained before work is begun.

B. Any deviation from the manufacturers' printed recommendations shall be explained and acknowledged as correct and appropriate for the circumstances, in writing, by the particular manufacturer. Any deviations must be reviewed by the Architect prior to any action by the Contractor. The Contractor will be held responsible for installations contrary to the respective manufacturers' recommendations.

1.03 SPECIALIST APPLICATOR/INSTALLER

A. Materials, equipment, systems, and assemblies requiring special knowledge and skill for the application or installation of such materials, equipment, systems, or assemblies shall be applied or installed by the specified product manufacturer or its authorized representative or by a skilled and experienced subcontractor qualified and specializing in the application or installation of the specified product with at least five years of successful experience in the type of work indicated and specified.

B. The installation subcontractor shall be approved by the product manufacturer, as applicable, and a copy of the installer's approval letter from the manufacturer shall be submitted to the Architect.

1.04 MANUFACTURER'S FIELD SERVICES

A. The manufacturer of a product, system, or assembly which requires special knowledge and skill for the proper application or installation of such product, system, or assembly shall provide appropriate field or job service at no additional cost to the Contractor or Owner. The manufacturer shall inspect and approve the application or installation work.

B. The Contractor shall make all necessary arrangements with the manufacturer of the products to be installed to provide onsite consultation and inspection services to assure the correct application or installation of the product, system, or assembly.

C. The manufacturer's authorized representative shall be present at the time any phase of this work is started.

D. The manufacturer shall inspect and approve all surfaces over which, or upon which the manufacturer's product will be applied or installed.

E. The manufacturer's representative shall make periodic visits to the site as the work proceeds as necessary for consultation and for expediting the work in the most practical manner.

1.05 TOLERANCES

A. Walls: Finished wall surfaces shall be plumb and shall have a maximum variation of 1/8 inch in 8 feet when a straightedge is laid on the surface in any direction, and no measurable variation in any 2-foot direction.

B. Ceilings: Finished ceiling surfaces shall present true, level, and plane surfaces, with a maximum variation of 1/8 inch in 8 feet when a straightedge and water level are laid on the surface in any direction and no measurable variation in any 2-foot direction.

C. Concrete floors: Tolerances for concrete floors and pavement are specified in Division 3.

D. Wood and Plywood Subfloors: Subfloor surfaces shall be level and shall have a maximum variation of plus or minus 1/8 inch in 10 feet. An additional tolerance of plus 1/4 inch per 2 feet of unsupported span will be allowed for camber.

E. Finished Floors: Level to within plus or minus 1/8 inch in 10 feet for hardwood and resilient floor coverings.

1.06 PROTECTION OF WOOD

A. Provide protection of all wood materials and products, whether or not installed, including erected and installed wood framing and sheathing, from water and moisture of any kind until completion and acceptance of the project.

B. The Contractor shall keep informed of weather conditions and forecasts, and when there is a likelihood of rain, shall protect installed and exposed framing and sheathing and stored lumber exposed to the elements with suitable water-repellent coverings, such as canvas tarpaulins and polyethylene sheeting.

C. Likewise, millwork and trim, paneling, cabinets, shelving, and products manufactured from wood shall be kept under cover and dry at the shop until time for delivery. Such materials shall not be delivered to the site until the building is roofed, and exterior walls are sheathed and protected with building paper as a minimum, the doors and windows are installed and glazed, and there is ample interior storage space for such materials and products. Delivery shall not occur during periods of rain, heavy dew, or fog.

D. Wood materials or products which become wet from rain, dew, fog, or other source will be considered to have moisture damage and will be rejected, requiring replacement by the Contractor with new, dry materials or products at no increase in the Contract Price. Excepted materials: installed exterior wood siding, exterior wood trim, exterior wood doors, and exterior wood windows, after specified treatments, such as exterior wood stain or paint, have been applied.

1.07 GROUT FILL

A. In applications where the grout installation may be subjected to moisture, the manufacturer shall submit a letter stating that the entire grout matrix does not contain any of the following:

1. Added gypsum.
2. Plaster-of-paris.
3. Sulfur trioxide levels in a portland cement component exceeding ASTM C 150's published limits.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 45 24 STRUCTURAL SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section summarizes the responsibility of the Contractor and the Special Inspector in the performance of the special inspections required in the Construction Documents.

B. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Special Inspector, nor approvals by persons other than the Architect/Structural Engineer shall relieve the Contractor from his obligation to perform the Work in accordance with the Construction Documents.

1.2 RELATED SECTIONS

A. Section 01 43 00 - Quality Assurance.

B. Section 01 45 29 – Testing Laboratory Services.

1.3 REFERENCES

A. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

B. American Council of Independent Laboratories – Recommended Requirements for Independent Laboratories Qualifications.

1.4 SELECTION AND PAYMENT

A. Owner will employ and pay for the structural testing/inspection services that are required by the Construction Documents.

B. Contractor shall pay for any additional structural testing/inspection required for Work or materials not complying with Construction Documents due to negligence or nonconformance.

C. Contractor shall pay for any additional structural testing/inspection required for his convenience.

1.5 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings for the required tests/inspections.

PART 2 – MATERIALS (Not Used)

PART 3 - EXECUTION

3.1 STRUCTURAL PRECONSTRUCTION MEETING

A. A structural preconstruction meeting may be conducted at the construction site by the Structural Engineer to discuss quality issues. The parties involved may be the Architect, Contractor, Special Inspector, appropriate subcontractors, suppliers, and detailers.

3.2 SPECIAL INSPECTOR'S RESPONSIBILITIES

A. Cooperate with the Contractor and provide timely service.

B. Upon arriving at the construction site, sign in and notify the Contractor of presence.

C. Select the representative samples that are to be tested/inspected.

D. Perform tests/inspections as outlined in Construction Documents, the applicable codes, and as directed by the Structural Engineer.

E. Report results of tests/inspections in accordance with the Construction Documents and the Building Code. Work and materials not complying with Construction Documents shall be immediately reported to the Contractor and Structural Engineer.

F. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of Work or materials tested/inspected, whether the work or materials complies with Construction Documents and name of the Structural Testing/Inspection Agency's representative.

G. Report and distribute results of tests/inspections promptly in the form of written reports as directed by the Structural Engineer.

H. Special Inspector shall not alter requirements of Construction Documents, approve or reject any portion of the Work, or perform duties of the Contractor.

I. Submit written confirmation at end of construction that, to the best of their knowledge, the structural Work conforms to the Construction Documents.

3.3 CONTRACTOR'S RESPONSIBILITIES

A. Provide copy of Construction Documents to the Special Inspector.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Special Inspector sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Special Inspector and provide access to Work.

E. Provide samples of materials to be tested in required quantities in accordance with section 01 45 29 Testing Laboratory Services.

F. Furnish copies of mill test reports when requested.

G. Provide storage space for Special Inspector's exclusive use, such as for storing and curing concrete testing samples.

H. Provide labor to assist the Special Inspector in performing tests/inspections.

3.4 OPTIONS

A. If the Structural Testing/Inspection Agency is located at such a distance from the Project that travel expenses will be a consideration, or if the amount of sampling performed is minor, and by mutual agreement of the Architect/Structural Engineer and Contractor, the Contractor may be requested to take samples and forward them to the Structural Testing/Inspection Agency for testing/inspection.

END OF SECTION

SECTION 01 45 29 TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Scope: The Contractor shall use testing laboratory services of the Mississippi Department of Transportation for all testing required in this Section. These services will be provided to the Contractor by the MDOT at no charge. Use of said services shall in no way relieve the Contractor of his obligation to perform Work in accordance with the Contract.

B. Inspection, Sampling and Testing are required for:

1. Section 31 23 12, Excavation, Fill and Grading.
2. Section 03 20 00, Concrete Reinforcing.
3. Section 03 30 00, Cast-In-Place Concrete.

1.02 LABORATORY'S DUTIES

A. Materials will be inspected and sampled in accordance with current Mississippi Department of Transportation SOP pertaining to inspecting and sampling.

B. Prepare reports of inspections and tests including:

1. Date issued.
2. Project title and number.
3. Testing laboratory, name and address.
4. Name and signature of inspector.
5. Date of inspection or sampling.
6. Record of temperature and weather.
7. Date of test.
8. Identification of product and Specification Section.
9. Location of Project.
10. Type of inspection or test.
11. Observations regarding compliance with Contract Documents requirements.

C. Distribute copies of reports of inspections and tests to Project Engineer and one copy to the MDOT Architect.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel to provide to laboratory in required quantities preliminary representative samples of materials to be tested.

B. When required, furnish copies of mill test reports. Furnish to laboratory, casual labor to obtain and handle samples at the site and to facilitate inspections and tests.

C. Provide facilities for laboratory's exclusive use for storage and curing of test samples.

D. Notify laboratory in advance of operations to allow for assignment of personnel and scheduling of tests.

1.04 MATERIAL CERTIFICATIONS AND CERTIFIED TEST REPORTS

A. All certifications shall meet the following requirements:

1. Have letterhead of the manufacturer, producer, supplier, or fabricator.
2. Include the project number.
3. Itemized list of materials covered by the certification.
4. Contain a material conformance statement, which certifies that the materials conform to the specific specification requirements.
5. Certification for all steel and steel wire products must also include a certified statement by the manufacturer that all of the manufacturing processes are of domestic origin.
6. Signature of a responsible company official.

B. All certified test reports shall meet the following requirements:

1. Have letterhead of the manufacturer, producer, supplier, fabricator, or laboratory.
2. Include name and description of material, lot, batch, or heat number, etc., as applicable.
3. Show results of each required test, and state that the test was run according to the test method specified.
4. Test reports for all steel and steel wire products must also include a certified statement by the manufacturer that all of the manufacturing processes are of domestic origin.
5. Signature of a responsible laboratory official.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 GENERAL

A. Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the Work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.

1.02 FIELD OFFICE AND STORAGE FACILITIES

A. The Contractor shall not be responsible for construction of a field office. The Contractor shall provide, maintain, and remove when directed, suitable substantial and watertight temporary field office and storage shed(s), in locations on the site as directed by the Project Engineer, or his authorized representative and best suited for their respective uses, as follows:

1. Field Office: The Contractor is not required to furnish a field office, but shall provide at the job site duplicates of all correspondence, shop drawings, plans, specifications, samples, etc. required to administer the Project. These duplicates will be permanently kept as reference and shall not be used in the field. Contractor shall provide the Project Engineer and the MDOT Architect with job site and emergency telephone numbers.
2. Storage Facilities: It shall be the Contractor's option to provide watertight storage facilities for storage of cement, lime, and / or other materials subject to water damage. If storage facilities are used, it shall be of sufficient size to hold all materials required for logically grouped activities on the site at one time, and shall have floors raised at least 6 inches above the ground on heavy joists or sleepers. Fully enclosed trailer is allowed, but location must be coordinated with Project Engineer.

1.03 FURNISHING AND MAINTENANCE OF EQUIPMENT

A. Furnish and maintain all equipment such as temporary stairs, ladders, ramps, scaffolds, hoists, runways, derricks, chutes, elevators, etc. as required for proper execution of the Work of all trades. All such apparatus, equipment and construction shall meet all the requirements of the Labor Law and other applicable State or local laws

1.04 ELECTRIC LIGHTS AND POWER

A. Supply lights and power when necessary for the progress of the Work. The operating costs shall be borne by the Owner. Temporary wiring, where required, shall be run in conduits.

1.05 WATER

A. Supply water service. The operating costs shall be borne by the Owner.

1.06 ROADS AND ACCESS

A. The drive is to remain open at all times. A flagman will be required to control traffic when construction vehicles are present.

1.07 TOILETS FOR WORKMEN

A. Provide and maintain all necessary toilets for workmen. Toilets are to be maintained in strict accordance with the regulations of the State Board of Health. The toilets are to be located on the site as directed by the Project Engineer or his authorized representative.

1.08 SECURITY / PROTECTION PROVISIONS

A. The types of temporary security and protection provisions required include, but are not limited to, fire protection, barricades, warning signs / lights, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at Project Site(s).

B. Barricades and Construction Fence: Provide and erect all necessary barricades and any other protection required. Provide all necessary warning and danger lights from twilight to sunrise.

C. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Provide Type A extinguishers at locations of low potential for either electrical or grease/oil flammable liquid fires: provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick-instructions at each extinguisher location, and instruct personnel at Project Site, at time of their first arrival, on proper use of extinguishers and other available facilities at Project Site. Post local fire department call number on each telephone instrument at Project Site.

D. Environmental Protection Procedures: Designate one person, the Construction Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air/water/soil, generation of noise, and similar harmful or deleterious effects which might violate regulations or reasonably irritate persons at or in vicinity of Project Site.

E. Water Control: Provide pumps as required to keep the excavation free from standing water and shall slope the excavation to prevent water from running toward existing buildings at all times.

1.09 BURNING OF TRASH

A. No burning of trash or debris shall be done on Owner's property. All such materials shall be removed from the site and disposed of in accordance with local laws and ordinances.

1.10 POWDER ACTUATED TOOLS

A. The use of powder actuated tools shall be prohibited from use during all phases of the construction, unless explicitly approved in writing, prior to construction, by the Project Engineer.

1.11 FIRE HAZARDS

A. Special precautions shall be taken to reduce fire hazards where electrical or gas welding or cutting Work is done and suitable fire extinguishing equipment shall be maintained near such operations.

1.12 CONDUCT OF WORKERS

A. Workmen, who, because of improper conduct or persistent violation of Owner's requirements, become objectionable, shall be removed at the Owner's request. Inform all workmen of Owner's requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 61 15 BASIC PRODUCT REQUIREMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The products of The Work and the requirements for their quality, delivery, handling, storage, protection and installation.

1.02 DEFINITIONS

A. "Products". Defined as: The materials, machinery, equipment, components, and systems, in whole or in part, incorporated into The Work. "Products" does not include materials, tools, devices, machinery, equipment and systems used for the preparation, manufacture, fabrication, conveying and installation of The Work.

B. "Level of Excellence". Defined as: The degree of quality for the Products and Workmanship of this Project. The required "degree of quality" shall be established on the basis of one or more of the following criteria which shall become the minimum acceptable "level of excellence" for the Work of this Project:

1. Products selected by Architect / Engineer.
2. Architect's / Engineer's Specifications.
3. Reference Standards.
4. Manufacturer's Instructions.
5. Industry Standards.
   a. In the absence of all the criteria from the Specifications Section, the normal local Industry Standard shall prevail. The Party or Parties responsible for the required work shall be experienced in the work to be provided; shall have knowledge as to what, in the local area, constitutes "good and acceptable practice" in producing the completed Work of this Section, and will be expected to provide nothing less.
      1) Example: Masonry and Drywall Contractors are expected to know that Industry Standards, "good practice", and "common sense" dictate, to prevent cracks in the completed work, control joints must be installed at minimum distances or should be placed in certain locations where movement or other stress conditions are likely to occur. When such items are not specified or shown on the Drawings, the Contractor will be expected to request the MDOT Architect's clarification for location (primarily for esthetic considerations) and then provide not less than the minimum Industry Standard, at no additional cost to the Owner.

C. "Standard of Quality". Defined as: A specific and particular manufacturer whose product(s) has / have been selected by the Architect as amply suitable to meet the Project requirements in one or more of the following criterions: appearance, physical attributes, performance characteristics, appropriateness for intended use, and cost.

1. The work of the individual Specification Section will be based on product(s) of the "Standard of Quality Manufacturer" and the product(s) of that manufacturer, designated within the Specifications Section by catalog number(s) (or other identification), shall become "Standard of Quality Product(s) and the basis by which the product(s) of "Other Acceptable Manufacturers", and any substitutions, are judged.
2. In the absence of the designation "Standard of Quality", such as for generic product, material or system, then the specified item (product, material or system) shall be the reference standard and shall become the "Standard of Quality".

D. "Equivalent Products". Defined as: Products having a level of excellence which, in the MDOT Architect's judgment, is equal to the level of excellence established by the product(s) selected as Architect's / Engineer's "Standard of Quality".

E. "Manufacturer". Defined as: An entity whose principal business is the manufacturing, fabricating, assembling, and / or supplying of products / systems from off site for incorporation (in whole, or in part, such as components of a system) into the construction at the Project Site.

1. The Architect's / Engineer's selection of a particular manufacturer usually is on the basis of the manufacturer's reputation within the Construction Industry, and / or "track record" with the Architect / Engineer, for producing quality products on time, and providing responsive follow-up and reliable warranties.
2. The terms "Fabricator" and "Supplier" used in these Specifications shall be synonymous with "manufacturer".

F. "Other Acceptable Manufacturers". Defined as: Manufacturers who have qualifications and products similar to those of the "Standard of Quality" Manufacturer (see above) selected by Architect / Engineer and are therefore "acceptable" to offer any of their products considered to be "equivalent" to the specified product(s).

1. To the best of the Architect's / Engineer's knowledge, information and belief, the manufacturers, listed as "Other Acceptable Manufacturers", now have products available that are considered to be "equivalent" to the specified product (or selection) of the "Standard of Quality" Manufacturer. Where no "Standard of Quality" is indicated then any of the "Acceptable Manufacturers" listed may offer products complying with the specified requirements.
2. The inclusion of particular manufacturers as "Other Acceptable Manufacturers" does not signify that other (that is, unlisted) manufacturers are not acceptable or that they do not have equivalent products nor does the omission of any manufacturer's name indicate unacceptability for any reason.
3. Manufacturers, who are not listed in the Contract Documents, and who desire consideration, must submit their product under provisions of Section 01 62 14 - Product Options and Substitutions Procedures.

1.03 QUALITY ASSURANCE – GENERAL

A. The quality of all products and workmanship shall be in accordance with the provisions of this Section and the requirements of the individual Specifications Section.

B. Whenever a "level of excellence" higher than the minimum industry standard is expected for products and workmanship, the more rigid standards and precise requirements will be indicated within individual Specifications Sections.

1. Example: For whatever reason, the Architect may specify a "dry film thickness (DFT)" for a coating that is more than the manufacturer's recommendation or than normally available in a three coat system. It shall be the Contractor's responsibility to achieve the required DFT with one or more additional coats, none of which shall be more than the manufacturer's recommendation for wet film thickness, for a single coat, when applied.

C. Establishing and maintaining Project Quality Control shall be the responsibility of the Contractor.

1.04 QUALITY ASSURANCE – PRODUCTS

A. All products incorporated into The Work shall be new except where otherwise provided by the Contract Documents and shall comply with the requirements of the individual Specifications Sections and as supplemented herein. All products incorporated into the Work shall be asbestos free. Products containing asbestos are not acceptable and will be considered as defective material. Whenever these products containing asbestos are discovered, they shall be removed from the Work at no cost to the Owner. Contractor shall certify that all materials incorporated into the Work are asbestos free, refer to Section 01 77 00 - Closeout Procedures.

B. Matching / Mating of Products:

1. Products required in quantity within a Specifications Section shall be the same, and shall be interchangeable.
2. All manufactured products exposed to view, especially those considered as "Finishes" (including, but not limited to, items as floor material, wall coverings, glass, paint ceiling tile, that are installed or applied directly from manufacturer's containers), shall be of the same factory "run".
3. The Contractor is expected to secure a sufficient quantity with initial purchase to avoid running short. Materials within an area that do not match, as a result of such failure, will be cause to reject all materials and will not be grounds for additional compensation.

C. Extra Materials: When required by individual Specifications Sections, provide products, spare parts and maintenance material in condition and quantities required. All "extra materials" shall be of the same factory "run" as installed materials. Deliver to Project Site, properly store in appropriate locations, and obtain receipt from authorized person prior to Final Payment.

1.05 QUALITY ASSURANCE – WORKMANSHIP

A. Comply with the "level of excellence" required by individual Specifications Sections. In the absence of specific requirements, comply with product(s) manufacturer's instructions and Industry Standards.

B. Use only suitably qualified craftsmen to produce work of the specified quality.

1. Craftsmen shall be of excellent ability, thoroughly trained and experienced in types of work required, completely familiar with the quality standards, procedures and materials required.
2. In the acceptance or rejection of manufactured and / or installed work, the MDOT Architect will make no allowance for the lack of skill on the part of workmen.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Provide finishes to match approved samples.

E. Adjusting of Operating Products: As follows:

1. Adjust moving parts of product / equipment (including, but not limited to, doors, drawers, hardware, appliances, mechanical and electrical equipment) to ensure smooth and unhindered operation and movement at time when Owner assumes control of item's use.
2. All items shall be properly set, calibrated, balanced, lubricated, charged, and otherwise prepared and ready for intended use.
3. Starting of Systems: When specified in individual Sections, require manufacturer's representative to be present at the Site to inspect, check, and approve equipment installation prior to start-up; to supervise placing equipment in operation; and to certify by written report that equipment has been properly installed, adjusted, lubricated, and satisfactorily operated under full load conditions.
4. Equipment/systems Demonstrations and Personnel Instruction: When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems and to instruct Owner's personnel on proper operation and maintenance manuals as basis of instruction and demonstration. Include start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at schedule times, at equipment location.

1.06 TRANSPORTATION AND HANDLING

A. Transport products by means and methods to avoid product damage; deliver in undamaged condition in manufacturers' unopened containers or packaging, keep dry.

B. Provide equipment and personnel to handle products by means to prevent soiling or damage.

C. Promptly inspect shipments for compliance with requirements, quantities, and damage.

1.07 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions. Protect prefinished surfaces from damage or deterioration by acceptable means; do not use adhesive papers, sprayed or strippable coatings that bond when exposed to sunlight or weather.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering (do not use "Visqueen" or other polyethylene sheeting when subject to direct sunlight); provide ventilation to avoid condensation.

C. Store loose granular materials on solid surface in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under specified conditions and are fit for use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 62 14 PRODUCT OPTIONS AND SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Scope: To give the product options available to the Contractor and to set forth the procedure and conditions for substitutions.

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards by any manufacturer.

B. For products specified by naming several (minimum of three) products or manufacturers, select any product and manufacturer named. Contractor must submit request, as required for substitution, for any product not specifically named and give reasons for not using product specified. Substitutions WILL NOT be granted unless reasons are considered justified.

C. For product specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or approved equal" after specified product, Contractor must submit request, as required for substitution, for any product not specifically named.

D. For products specified by naming only one product and manufacturer, an equivalent product will always be accepted if it is equal in all respects (size, shape, texture, color, etc.). The Contractor must submit a request for substitution as set forth in this section

E. For products specified by naming only one product and manufacturer and stating no substitutions will be accepted, there is no option and no substitutions will be allowed.

1.03 PRODUCT SUBSTITUTION LIST

A. The Architect will NOT consider requests for substitutions during bidding.

B. Within 45 days after Notice to Proceed, submit to the MDOT Architect 4 copies of complete list of all proposed product substitutions. Substitutions WILL NOT be considered if received after this time.

C. Tabulate list by each Specification Section.

D. For named products specified with reference standards, include with listing of each product:

1. Name and address of manufacturer.
2. Trade name.
3. Model or catalog designation.
4. Manufacturer's data.
5. Performance and test data.
6. Reference standards.

E. Proposed product will be reviewed for incorporation into the Project. Contractor will be notified for substitution rejection if not allowed, or will be instructed to submit in standard substitution submittal process for approval. See attached Substitution Request Form.

1.04 SUBSTITUTIONS

A. The MDOT Architect will consider formal written requests from Contractor for substitution of products in place of those specified. ONLY ONE REQUEST per product will be allowed. Refer to Section 01 33 00 - Submittal Procedures. Include in request:

1. Complete data substantiating compliance of proposed substitutions with Contract Documents.
2. For products:
   a. Product identification including manufacturer's name and address.
   b. Manufacturer's literature: Submit literature of actual product specified and literature of proposed substitution with all comparable features or components highlighted. Highlighted information is to include, but shall not be limited to, product description, performance, test data and reference standards.
   c. Samples of the proposed substitution.
   d. Name and address of 3 similar projects on which product was used and date of installation.
3. For construction methods:
   a. Detailed description of proposed method.
   b. Drawings illustrating methods.
4. Itemized comparison of proposed substitution with product or method specified.
5. Data relating to changes in construction schedule.
6. Accurate cost data on proposed substitution in comparison with product or method specified.

B. In making request for substitution, Contractor represents:

1. He has personally investigated proposed product or method, compared the product specified with the proposed substitution, and determined that it is equal or superior in all respects to that specified.
2. He will provide the same guarantee for substitution as for product or method specified.
3. He will coordinate installation of accepted substitution into Work, making such changes required of Work to be complete in all respects.
4. He waives all claims for additional costs related to substitution that consequently becomes apparent.
5. Cost data is complete and includes all related costs under his Contract.

C. Substitutions WILL NOT be considered if:

1. They are indicated or implied on Shop Drawings or product data submittals without formal request submitted in accordance with this Section.
2. Acceptance will require substantial revision of Contract Documents.
3. In the MDOT Architect’s judgment, the product or material is not equal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRODUCT SUBSTITUTION REQUEST FORM (AS FOLLOWS)

SUBSTITUTION REQUEST FORM

PROJECT:_____PROJECT NO._____

OWNER:_____

CONTRACTOR:_____

ARCHITECT:_____

_____

_____

_____

CONTRACTOR'S REQUEST, WITH SUPPORTING DATA

1. Section of the Specifications to which this request applies:

   _____

   [ ] Product data for specified item and proposed substitution is attached (description of product, reference standards, performance and test data).

   [ ] Sample is attached

2. Itemized comparison of proposed substitution with product specified.

	ORIGINAL PRODUCT	SUBSTITUTION
Name, brand	_____	_____
Catalog No.	_____	_____
Manufacturer	_____	_____

Significant variations:_____

_____

3. Proposed change in Contract Sum:

   Credit to Owner: $_____

   Additional Cost to Owner: $_____

4. Effect of the proposed substitution on the Work:

   Contract Time: _____

   Other Contracts, if any:_____

CONTRACTORS STATEMENT OF CONFORMANCE OF PROPOSED
SUBSTITUTION TO CONTRACT REQUIREMENTS

I / We have investigated the proposed substitution. I / We

1. Believe that it is equal or superior in all respects to originally specified product, except as stated in 2. above;
2. Will provide same warranty as required in Contract Documents;
3. Have included all cost data and cost implications of proposed substitution; including, if required, costs to other contractors, and redesign and special inspection costs caused by use of proposed substitution;
4. Will coordinate incorporation of proposed substitution in the Work;
5. Will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning;
6. Have verified that use of this substitution conforms to all applicable codes.
7. Waive future claims for added cost to Owner caused by proposed substitution.

CONTRACTOR_____DATE:_____
Signature

ARCHITECT'S REVIEW AND ACTION

___ Accepted

___ Not Accepted

___ Provide more information in the following categories and resubmit _____

___ Sign Contractor's Statement of Conformance and resubmit

___ Proposed substitution is accepted, with the following conditions:

_____

_____

Change Order will make the following changes:

(Add to) (Deduct from) Contract Sum: $_____

(Add to) (Deduct from) Contract Time: _____days

ARCHITECT:_____DATE_____

OWNER: _____DATE_____

_____Accepted _____Not accepted

END OF SECTION

SECTION 01 73 29 CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Scope: To set forth broad general conditions covering cutting and patching that applies to everyone and everything on the job.

B. Execute cutting including excavating, fitting or patching or work required to:

1. Make several parts fit properly.

2. Uncover work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to Contract requirements.

5. Install specified work in existing construction.

C. In addition to Contract requirements, upon MDOT Architect's written instructions:

1. Uncover work for observation of covered work.

2. Remove samples of installed materials for testing.

3. Remove work to provide alteration of existing work.

D. Do not cut or modify work of another Contractor without his consent.

E. Payment for Costs: Costs caused by ill-timed, defective or work not conforming to the Contract will be borne by party responsible for ill-timed, defective or non-conforming work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials for replacement of work removed shall comply with individual Specifications Sections for type of work to be done.

PART 3 - EXECUTION

3.01 GENERAL

A. Inspection: Inspect existing conditions of work, including elements subject to movement or damage during cutting and patching.

B. Preparation prior to cutting: Provide shoring, bracing and supports required to maintain structural integrity. Provide protection for other portions of project and protection from the elements.

C. Performance:

1. Execute cutting and demolition of methods that prevent damage to other work and will provide surfaces to receive installation of repairs and new work.

2. Execute excavating and backfilling by methods that prevent damage to other work and prevent settlement

3. Restore work that has been cut or removed install new products to provide completed work in accordance with requirements of the Contract Documents.

4. Refinish entire surfaces as necessary to provide an even finish. Refinish continuous surfaces to the nearest intersection and assemblies.

END OF SECTION

SECTION 01 74 00 CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Scope: Maintain premises and public properties from accumulations of waste, debris, and rubbish, caused by operations. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

B. Dispose of all waste, debris and rubbish in accordance with the 0wner's requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by the manufacturer of surface to be cleaned, but cross reference cleaning materials used on surfaces to insure they are recommended by the cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute cleaning to insure that structure, grounds, and surrounding properties are maintained free from accumulations of waste materials and rubbish. Wet down dry materials and rubbish to lay dust and prevent blowing dust. Clean site and surrounding properties at reasonable intervals during progress of Work, and remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off MDOT owned property. Handle materials in a controlled manner with as few handling as possible; do not drop or throw materials from heights. Schedule cleaning operations so that dust or other contaminants resulting from cleaning process will not fall on wet or newly painted surfaces.

B. No materials may be disposed of by dumping them in the sanitary or storm sewer systems without specific approval by the Owner.

C. Washdown of cement trucks will be done at locations determined by the Project Engineer.

3.02 FINAL CLEANING

A. Employ experienced workmen, or professional cleaners, for final cleaning. In preparation for Inspection of structure, conduct final inspection of sight-exposed surfaces and concealed spaces. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed finished surfaces. Repair, patch and touch up marred surfaces to specified finish to match adjacent surfaces.

B. Remove temporary fencing and leave in same condition as surrounding landscaped areas.

C. Broom clean paved surfaces; rake clean other surfaces of grounds. Keep Project clean until occupied by Owner.

END OF SECTION

SECTION 01 77 00 CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Scope of Work required under this Section consists of the Final Inspections, submitting of all closeout Documents and related items to complete the Work indicated on the Drawings and described in the Project Manual.

1.02 FINAL INSPECTIONS

A. Engineer and Architect's Inspection: The Contractor shall make written request for a Final Inspection to the Project Engineer and MDOT Architect. Notice is to be given 10 calendar days prior to this inspection. At the day of inspection, the Contractor shall have in hand 6 copies of the HVAC Test and Balance Report, Reference Specification Sections in Division 23 and 6 copies of a list prepared by the Contractor of deficiencies, which will be edited by the Project Engineer, MDOT Architect and Consultants. A copy of these composite lists will be given to the Contractor for correcting the Work. Within 15 calendar days after this revised list is received, the Contractor shall make all corrections of the items listed. If, in the Project Engineer and MDOT Architect's judgment, the Project is not ready for an Inspection, the Project Engineer may schedule another inspection.

B. Owner's Inspection: After the Project Engineer and MDOT Architect have determined the Project to be Complete and all punch list items have been corrected, an Owner's Inspection will be scheduled. The Contractor shall submit a letter that states all items have been corrected and submit required closeout Documents. The Owners may add to the punch list items; if it is determined that corrective work still needs to be done. Within 15 calendar days after this revised list is received, the Contractor shall make all corrections of the items listed.

C. Correction of Work before Final Payment: Contractor shall promptly remove from the Owner's premises, all materials condemned for failure to conform to the Contract, whether incorporated in Work or not, and Contractor shall, at his own expense, replace such condemned materials with those conforming to the requirements of the Contract. Failure to remedy such defects after 10 days written notice will allow the Owner to make good such defects and such costs shall be deducted from the balance due the Contractor or charged to the Contractor in the event no payment is due.

D. Should additional inspections by the MDOT Architect's Consultants of the Work be required due to failure of the Contractor to remedy defects listed, the Project Engineer may deduct the expense of additional Consultants inspections from the Contract Sum in the Owner / Contractor Agreement. The additional expense will be based on the rate shown for services in the Consultants' Architect or Engineering Services Contract.

1.03 FINAL ACCEPTANCE

A. The Mississippi Department of Transportation does not recognize the term "Substantial Completion". The Project Engineer shall determine when the building is complete to the point it can be used for its intended purpose and occupied. This date shall be the Date of Completion.

B. All Warranties and Extended Warranties shall use this Date of Completion as the starting date of Warranty Period.

C. Final Payment shall not be made until items covered in Closeout Procedures are satisfied. This date shall be the Date of Final Acceptance.

1.04 CLOSEOUT DOCUMENTS

A. Unless otherwise notified, the Contractor shall submit to the Owner through the Project Engineer to the MDOT Architect 2 copies the following before final payment is made:

1. Request for Final Payment: AIA Document G702, current edition, completed in full or a computer generated form having similar data.

2. Contractor's Affidavit of Payment of Debts and Claims: AIA Document G706, current edition, completed in full.

3. Release of Liens and Certification that all Bills Have Been Paid: AIA Document G706A, current edition, completed in full or a sworn statement and affidavit from the Contractor to the Owner stating that all bills for this project have been paid and that the Owner is released from any and all claims and / or damages.

4. Consent of Surety Company to Final Payment: AIA Document G707, current edition, completed in full by the Bonding Company.

5. Power of Attorney: Closeout Documents should be accompanied by an appropriate Power of Attorney.

6. Guarantee of Work: Sworn statement that all Work is asbestos free and guaranteed against defects in materials and workmanship for one year from Date of Completion, except where specified for longer periods.
   a. Word the guaranty as follows: "We hereby guarantee all Work performed by us on the above captioned Project to be free from asbestos and defective materials. We also guarantee workmanship for a period of one (1) year or such longer period of time as may be called for in the Contract Documents for such portions of the Work".
   b. All guarantees and warranties shall be obtained in the Owner's name.
   c. Within the guaranty period, if repairs or changes are requested in connection with guaranteed Work which, in the opinion of the Owner, is rendered necessary as a result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such guaranteed Work, correct all defects wherein and make good all damages to the building, site, equipment or contents thereof which, in the opinion of the Owner, is the result of the use of materials, equipment, or workmanship which are inferior, defective or not in accordance with the terms of the Contract; and make good any Work or materials or the equipment and contents of said buildings or site disturbed in fulfilling any such guaranty.
   d. If, after notice, the Contractor fails to proceed promptly to comply with the terms of the guaranty, the Owner may have the defects corrected and the Contractor and his sureties shall be liable for all expense incurred.
   e. All special guaranties applicable to definite parts of the Work stipulated in the Project Manual or other papers forming part of the Contract shall be subject to the terms of this paragraph during the first year of the life of such special guaranty.

7. Project Record Documents: Furnish all other record documents as set forth in Section 01 78 39 - Project Record Documents.
   a. Provide all certificates, warranties, guarantees, bonds, or documents as called for in the individual Sections of the Project Manual. The Contractor is responsible for examining the Project Manual for these requirements
8. Additional Documents Specified Within the Project Manual:
   a. General: Provide all Operational and Maintenance documents as called for in the individual Sections of the Project Manual. The Contractor is responsible for examining the Project Manual for these requirements.
   b. Maintenance Stock: Deliver to Owner all required additional maintenance materials as required in the various Sections of the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, a finishes systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.02 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.

1.03 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual with request for Final Inspection. Include a complete operation and maintenance directory. MDOT Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 2 copies of each manual in final form at least 5 days before Owner’s Final Inspection. MDOT Architect will return one copy with comments (if required) within 15 days after Owner’s Final Inspection.

1. Correct or modify each manual to comply with MDOT Architect's comments. Submit 2 copies of each corrected manual within 15 days of receipt of MDOT Architect's comments.

1.04 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

2.01 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. 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 inches by11 inches 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 inches by11 inches 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.

2.02 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. Chemical release or spill.
8. System, subsystem, or equipment failure.

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.

2.03 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.
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.

2.04 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. Include procedures to follow and required notifications for warranty claims.

2.05 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 from manufacturers / suppliers.

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 Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

A. 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.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. 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.

D. 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.

1. 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.
2. 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.

E. 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 newly prepared Record Drawings in Division 01 Section "Project Record Documents."

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39 PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: To set forth the minimum procedure and requirements for keeping the Project Record Documents. One of these Documents is to be kept on site throughout the Project.

1.02 MAINTENANCE OF DOCUMENTS

A. Maintain 2 copies of all: Half-size Contract Drawings, Project Manual (Proposal), Addenda, Change Orders, Warranties, Certificates, Guarantees, Bonds, reviewed Shop Drawings, reviewed submittals (materials, fixtures, appliances, etc.), hardware schedules, field and laboratory test records, equipment brochures, spare parts lists, maintenance and operation manuals and other modifications to the Contract.

B. Store Record Documents apart from Documents used for construction.

C. Maintain Record Documents in clean, dry, and legible condition. Do not use Record Documents for construction purposes.

D. Make Record Documents available at all times for inspection by the Project Engineer, MDOT Architect and Owner.

1.03 RECORDING

A. General: Mark all modifications in red pencils. Keep Record Documents current. Review log at Progress Meetings. Do not permanently conceal any Work until required information has been accurately recorded.

B. Contract Drawings: Legibly mark to record actual construction:

1. Horizontal and vertical location of underground and overhead utilities with their connections referenced to permanent surface improvements.
2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
3. Field changes that involve dimension and detail.
4. Changes made by Supplemental Agreement (Change Order) or Field Order.

C. Project Manual (Proposal) and Addenda: Legibly mark up each Section to record manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

D. Shop Drawings: Maintain as Record Documents; legibly mark Drawings to record changes made after review.

1.04 SUBMITTALS

A. Furnish two (2) copies of all Record Documents.

B. The information, except Contract Drawings, shall be arranged and labeled by corresponding Specification Section, neatly bound in three ring binders, indexed, and all drawings readable without being removed or unstapled.

C. The name and address of each subcontractor and material supplier shall be listed in front of each binder along with the Project Manual (Proposal).

D. Sufficient information, such as as-built control drawings for air handling system and variable drive controls, shall be furnished to allow qualified personnel to service equipment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete.

D. Section 07 26 00 – Vapor Retarders (for under slab vapor retarders).

1.02 REFERENCES

A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 – Standard Specifications for Structural Concrete.

C. ACI 318 – Building Code Requirements for Structural Concrete.

D. ACI 347 – Guide to Formwork for Concrete.

E. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

F. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

G. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

H. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

I. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

J. ASTM E1993 – Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

K. ASTM F1249 – Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.03 SUBMITTALS

A. Submit manufacturer's data for:

1. Expansion/Isolation Joint Filler.
2. Waterstops.

1.04 DESIGN OF FORMWORK

A. Design of formwork, shoring, and reshoring and its removal is the Contractor's responsibility.

B. Design of formwork, shoring, and reshoring shall conform to ACI 117, ACI 301, ACI 318, and ACI 347.

C. Design formwork in a manner such that existing or new construction is not overloaded.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Form Material: Wood, plywood, metal, fiberglass or a combination of these, with sufficient strength to prevent distortion.

B. Form Definitions
1. Standard Forms: No form-facing material required. Standard forms are acceptable everywhere except for Architectural Concrete elements.

2.02 FORMWORK ACCESSORIES

A. Formwork Accessories: Commercially manufactured products, including ties and hangers. Do not use nonfabricated wire form ties.

2.03 FORM RELEASE AGENT

A. Form release agent: Non-staining type, “Noxcrete" or approved equal. Release agent must not affect bonding of finishes on exposed concrete.

2.04 VAPOR RETARDER

A. Vapor Retarder: See Section 07 26 00 – Vapor Retarders

2.05 EXPANSION / ISOLATION JOINT FILLER

A. Expansion / Isolation Joint Filler: ASTM D1751, asphalt impregnated premolded fiberboard, 1/4-inch thick by full thickness of slab or joint, unless indicated otherwise in the Structural Drawings.

2.06 CONSTRUCTION JOINTS

A. Slabs On Grade: Steel plate dowel (3/8 inch thick) such as manufactured by PNA Construction Technologies, Inc., Greenstreak Group, Inc., or approved equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Erect formwork in accordance with ACI 301 and ACI 347.

B. Finished work shall comply with tolerances of ACI 117.

C. Provide 3/4-inch chamfer at all formed corners.

3.02 FOUNDATION ELEMENTS

A. Form foundation elements if soil or other conditions are such that earth trench forms are unsuitable.

B. Sides of perimeter grade beams, foundation walls, and turned-down slabs shall be formed.

C. Maintain minimum coverage of reinforcing steel as indicated in Structural Drawings.

3.04 FORM PREPARATION

A. Seal form joints to prevent leakage.

B. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed.

C. Before reinforcement is placed, coat contact surfaces of form with form release agent in accordance with manufacturer's recommendations. Do not allow excess form release agent to accumulate in forms or come in contact with concrete surfaces against which fresh concrete will be placed.

3.05 INSERTS AND EMBEDMENT ITEMS

A. Install and secure in position required inserts, embeds, hangers, sleeves, anchors, and nailers.

B. Locate anchor bolts/rods in position in accordance with approved setting drawings and secure to prevent displacement during concrete placement.

3.06 PROVISIONS FOR OTHER TRADES

A. Install openings in concrete formwork to accommodate work of other trades. Determine size and location of openings and recesses from trades requiring such items. Obtain approval from Structural Engineer for openings not shown in Structural Drawings.

B. Accurately place and securely support items built into forms.

3.07 CONSTRUCTION JOINTS

A. Slabs On Grade: Install steel plate dowels in accordance with manufacturer's recommendations. Place plate dowels at mid-depth of slab (+/-1/4-inch), unless noted otherwise in the Structural Drawings.

B. Framed Construction:

1. Install construction joints in accordance with ACI 318.
2. Obtain Architect/Structural Engineer's prior approval for use and location of joints.

3. Provide 1-1/2 inch deep key-type construction joints at end of each placement for framed slabs, beams, walls, and footings. Bevel forms for easy removal.
4. Remove loose particles and latency from surface prior to placing the next lift. Chip the surface to a depth sufficient to expose sound concrete.

3.08 FORMWORK REMOVAL

A. Remove formwork carefully in such manner and at such time as to ensure complete safety of structure. Do not remove formwork, shoring, or reshoring until members have acquired sufficient strength to support their weight and the load thereon safely.

3.09 FINISHES OF FORMED SURFACES

A. Standard Form Finish: Patch tie holes and defects. Chip or rub off fins exceeding ¼ inch in height. Leave surface with the texture imparted by the forms.

END OF SECTION

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 10 00 – Concrete Forming and Accessories.

C. Section 03 30 00 – Cast-in-Place Concrete.

1.02 REFERENCES

A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 – Standard Specifications for Structural Concrete.

C. ACI 315 – Details and Detailing of Concrete Reinforcement.

D. ACI 318 – Building Code Requirements for Structural Concrete.

E. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.

F. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

G. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

H. ASTM A1044 – Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.

I. AWS D1.4 – Structural Weld Code - Reinforcing Steel.

J. AWS D12.1 – Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

CRSI – Manual of Standard Practice.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings:

1. Notify Structural Engineer prior to detailing reinforcing steel shop drawings.

2. Indicate size, spacing, location and quantities of reinforcing steel and wire fabric, bending and cutting schedules, splice lengths, stirrup spacing, supporting and spacing devices. Detail reinforcing steel in accordance with ACI 315 and CRSI Standards.
3. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.
4. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Submit manufacturer's data for tension and compression splicers.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 STORAGE AND PROTECTING

A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings that might impair bond.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Deformed Reinforcing Steel: ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).

B. Welded Steel Wire Fabric: ASTM A185.

2.02 ACCESSORY MATERIALS

A. Annealed Steel Tie Wire: 16½ gage minimum.

B. Bar Supports: Plastic-tipped steel Class I bar supports conforming to CRSI Specifications. Concrete brick may be used to support reinforcement to obtain proper clearance from earth.

2.03 SPLICERS

A. Tension Splicers: Capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.

2.04 DOWEL ADHESIVE

A. Dowel Adhesive: EPCON System Ceramic 6 Epoxy adhesive supplied by ITW Ramset/Red Head, HIT HY150 injection adhesive supplied by Hilti Fastening Systems, Power-Fast epoxy injection gel or AC100 Plus supplied by Powers Fasteners, SET High Strength Epoxy supplied by Simpson, or approved equal.

PART 3 - EXECUTION

3.01 FABRICATION

A. Fabricate reinforcing steel in accordance with ACI 318 and CRSI standards.

B. Bend bars cold. Do not heat or flame cut bars. No field bending of bars partially embedded in concrete is permitted, unless specifically approved Structural Engineer and checked by Testing and Inspection Agency for cracks.

C. Weld only as indicated. Perform welding in accordance with AWS D1.4 and AWS D12.1.

D. Tag reinforcing steel for easy identification.

3.02 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles and coatings.

B. Place, support, and secure reinforcement against displacement in accordance with ACI 318 and CRSI standards. Do not deviate from alignment or measurement.

C. Place concrete beam reinforcement support parallel to main reinforcement.

D. Locate welded wire reinforcement in the top third of slabs. Overlap mesh one lap plus two inches at side and end joints.

E. Furnish and install dowels or mechanical splices at intersections of walls, columns and piers to permit continuous reinforcement or development lengths at such intersections.

F. Maintain cover and tolerances in accordance with ACI and CRSI Specifications, unless indicated otherwise on Structural Drawings.

3.03 SPLICES

A. Do not splice reinforcement except as indicated on Structural Drawings.

B. Tension couplers may be used and installed in accordance with manufacturer's recommendations.

3.04 HEADED STUD ASSEMBLIES

A. Place headed stud assemblies as indicated in the Structural Drawings.

3.05 DOWELS IN EXISTING CONCRETE

A. Install dowels and dowel adhesive in accordance with manufacturer’s recommendations.

B. Minimum embedment length into the existing concrete shall be 12 bar diameters, unless noted otherwise.

END OF SECTION

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 10 00 – Concrete Forming and Accessories.

C. Section 03 20 00 – Concrete Reinforcing.

D. Section 03 62 00 – Non-shrink Grouting.

E. Section 09 67 27 – Resinous Flooring.

1.02 REFERENCES

A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 – Specifications for Structural Concrete.

C. ACI 318 – Building Code Requirements for Reinforced Concrete.

D. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.

E. ASTM C33 – Standard Specification for Concrete Aggregates.

F. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

G. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

H. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

I. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.

J. ASTM C150 – Standard Specification for Portland Cement.

K. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

L. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

M. ASTM C230 – Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.

N. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

O. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

P. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

Q. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

R. ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Submit three copies of the concrete mix designs. Include the following:

1. Documentation of mix design proportions complying with ACI 318, Chapter 5.
2. Type and quantities of materials including admixtures
3. Slump
4. Air content
5. Water/cement ratio
6. Fresh unit weight
7. Aggregates sieve analysis
8. Design compressive strength
9. Location of placement in structure
10. Method of placement
11. Method of curing
12. Seven-day and 28-day compressive strengths

1.04 QUALITY ASSURANCE

A. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.

B. Concrete work shall conform to all requirements of ACI 301, Specifications for Structural Concrete for Buildings and ACI 318 Building Code Requirements for Reinforced Concrete, latest editions, except as modified by supplemental requirements herein.

C. Concrete mix design proportioning shall be by a certified MDOT Class III technician and submitted to the Project Engineer prior to placing concrete. Mix proportions shall meet the requirements of the 804.02.10 Section of the MDOT's Standard Specifications, 2004 Edition, except concrete requiring a trowel finish shall not be air entrained. Concrete shall be sampled according to ASTM C 172 and compression test cylinders made and cured according to ASTM C 31. Control of mixes is to be maintained at the Ready-Mix Plant and on the job site. Adjustments of the mix proportions shall meet the requirements of Section 804.02.10.4 of MDOT's Standard Specifications, 2004 Edition.

D. The Owner will mold and cure compression test cylinders (two cylinders per set) from concrete at the job site from the first placement of each mix design placed each day and additionally for each 75 cubic yards, or fraction thereof, of each mix design placed in a single day. In addition to sampling concrete in accordance with ASTM C 172, the Owner will follow the sampling requirements Paragraph 6.1.2 in the latest edition of the Department's *Concrete Field Manual*. Cylinders will be tested in accordance with ASTM C 39. The Owner will mold one set of cylinders for ensuring the concrete meets the minimum 28-day acceptance requirements. The Owner will mold three sets of cylinders for form removal in accordance with Subsection 907-804.03.15. Forms may be removed when the compressive strength of the field cured cylinders reaches 2000 psi. In addition to determining the slump, temperature, and total air content of the concrete used for molding the test cylinders, the Owner will determine the yield of each mix design during the first placement of each mix design. Copies of all test reports shall be furnished to the ready mixed concrete producer and as directed by the Project Engineer.

PART 2 - PRODUCTS

2.01 CONCRETE MIX DESIGN

A. Establish concrete mix design proportions in accordance with ACI 318, Chapter 5.

B. All concrete, unless otherwise specifically approved in writing by the Project Engineer, shall be transit-mixed in accordance with ASTM C94. Control of concrete shall be under supervision of testing laboratory as described in Section 01 45 29.

C. Maximum slump for normal weight concrete shall be 4 inches. Sump may be increased to 6 inches with an approved mid-range water reducer and up to 8 inches with an approved high-range water reducer.

D. Water/Cementitious Materials Ratio (w/cm): See Structural Notes in Structural Drawings.

E. Entrained Air Content: See Structural Notes in Structural Drawings.

F. Fresh Unit Weight

1. Normal weight concrete: Fresh unit weight of 137 to 148 pcf.

2.02 CONCRETE MIXES

A. The ready-mix concrete shall be mixed and delivered in accordance with requirements of ASTM C 94. Uniformly and accurately control proportions of material weight. Slump tolerances given in ASTM C 94 apply. Calcium chloride shall not be used.

B. Failure of concrete to meet the specified requirements may result in rejection with subsequent removal and replacement or re-testing (including coring, load test, etc.) at the supplier's expense. Concrete exhibiting adverse reaction as a result of the presence of deleterious substances shall be removed and replaced or repaired in a manner completely satisfactory to the Project Engineer. All cost of such corrective action, including all necessary testing, shall be borne by the concrete producer.

C. The Contractor may request adjustment to concrete mix design when characteristics of materials, job conditions, weather, test results, or circumstances warrant, at no additional cost to the Owner and as approved by the Project Engineer. Laboratory test data for revised mix designs and strength results must be submitted to and approved before using in the Work.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C-150, Type I.

B. Water: Potable water from an approved source. Water shall be free of deleterious substances and comply with ACI 318.

C. Structural Concrete Aggregate: Nominal maximum aggregate size 57 shall be used and shall meet the requirements of MDOT Standard Specifications, 2004 Edition.

D. Admixtures: Admixtures shall be from the MDOT Approved List. Non-uniform addition of mixtures that result in erratic setting of the concrete will cause rejection of the concrete with subsequent removal from the structure at the concrete producer's expense.

E. Air Entraining Agent: Air entraining agent complying with ASTM C260.

F. Water Reducer: Water reducing agent complying with ASTM C494.

G. Mid-range/High-range Water Reducer: Mid-range and high-range water reducers (plasticizers) complying with ASTM C494.

H. Chlorides: Chlorides of any form shall not be used in concrete.

I. Fly Ash: Class F fly ash with a loss on ignition of less than five percent or Class C fly ash with a loss on ignition of less than one percent complying with ASTM C618.

J. Accelerators: Non-chloride accelerators complying with ASTM C494.

K. Retarders: Retarders complying with ASTM C494.

L. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and recommendations, published by the manufacturer of such materials are included in and are a part of these Specifications.

2.04 RELATED MATERIALS

A. Preformed Expansion Joint Fillers: Provide pre-molded, asphalt impregnated board in widths and thickness required by conditions (1/2-inch minimum). Joint fillers shall conform to ASTM D994, D1751 or D1752.

B. Chemical Hardener (Sealer): Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent containing not less than 2 pounds of fluosilicates per gallon. Sealer shall not interfere with floor finish.

C. Curing Compound: Clear bond, manufactured by Guardian Chemical Co., Kure-N-Seal, manufactured by Sonneborn, Safe-Cure, manufactured by Dayton Superior Corp. or approved equal. Compound shall not interfere with bonding or floor finish.

PART 3 - EXECUTION

3.01 GENERAL

A. Prepare place of deposit, mix, convey, and place in accordance with ACI 301.

B. Concrete shall be placed so as to avoid segregation of materials and to prevent cold joints by avoiding re-handling, by keeping pours generally level, and by adequate vibration. Placing is not to be started during rain or snow, and if placing is underway when such conditions occur, continue operations only long enough to provide a suitable construction joint.

C. During hot weather or periods of low humidity combined with a definite breeze, rapid loss of moisture shall be discouraged by thorough wetting of forms and by using a fine fog spray when finishing. At these times particular attention shall be given to providing an adequate number of finishers to expedite this operation. During cold weather fresh concrete shall be protected from freezing.

D. Prior to placing, forms shall be cleaned free of foreign material and shall be washed down with water. Placing shall be a continuous operation between planned construction joints with fresh cement mixed only with plastic concrete already in place. Avoid cold joints.

E. Vibration shall be thorough, using vibrators small enough to work within reinforcing. The vibrator shall be inserted at many points about 24 inches apart. Avoid over-vibration and transporting concrete in form by vibration. A spare vibrator, which will operate, shall be kept on the job during all placing operations.

F. Deposit concrete as near as practical to final position.

G. Place and finish concrete members to comply with tolerances in ACI 117.

H. Do not use aluminum equipment in placing and finishing concrete.

3.02 SLABS-ON-GRADE

A. Place concrete for slabs-on-grade on properly prepared granular subbase with vapor barrier.

B. Place thickened slabs for partitions integral with floor slabs.

3.03 MID-RANGE / HIGH-RANGE WATER REDUCERS

A. Mid-range or high-range water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.

3.04 ADDITION OF WATER AT JOB SITE

A. Water may be added at the jobsite if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded. All concrete delivery trucks will have actual batch weight tickets available that clearly indicate the quantity of water that may be added at the jobsite that will not exceed the maximum water/cement ratio.

3.05 TIME LIMIT

A. Deposit concrete within one and one-half hours after batching.

3.06 CURING

A. Begin curing procedures immediately following the commencement of the finishing operation.

B. Keep all concrete moist for 5 days after placing by covering with concrete curing paper, by leaving forms in place or by using curing compound. All combined with regular wetting as necessary.

C. If an acrylic curing compound is used, apply in accordance with manufacturer's recommendations to surfaces of concrete not protected for five days by formwork. Do not use curing compound in areas to receive material that does not adhere to concrete cured with a curing compound unless the curing compound is water-soluble.

3.07 CONSTRUCTION JOINTS

A. Locate construction joints and provide shear keys as directed by the Project Engineer / MDOT Architect. Allow concrete to set for 24 hours before an adjoining pour is started. Slabs across the joint shall be level and the surface shall be level and shall not be feathered. Before proceeding with the following pour at a joint, thoroughly clean the joint, remove all loose material, and brush in a thick cement slurry.

3.08 CUTTING CONCRETE

A. Obtain Architect/Structural Engineer's written approval prior to cutting concrete for installation of other work.

3.09 PATCHWORK AND REPAIRS

A. Notify Architect/Structural Engineer of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over 2 inches in diameter to solid concrete but not less than a depth of one inch. Make edges of cuts perpendicular to the concrete surface.

B. Honeycombed and defective concrete shall be removed and replaced, or repaired, as directed by the Project Engineer. Form tie holes and minor areas, as determined by the Project Engineer, shall be repaired as follows:

1. Completed patch shall be indistinguishable from surrounding surfaces in color and texture.
2. Patching mixture, using same cement sand as used in concrete shall consist of 1 part cement to 2-parts sand, with just enough mixing water to permit placing. Premix mixture, allow standing at least 30 minutes before using, stirring with trowel during this period.
3. Remove material to sound concrete, dampen surface and brush thick 1 to 1 cement sand bond coat into surface.
4. When bond coat begins to lose water sheen, thoroughly pack patching mixture in place, leaving it somewhat higher than adjacent surface. Embed pieces of gravel by hand into patch.

3.10 CONCRETE FINISHES

A. Finish Concrete in accordance with ACI 301.

B. Trowel finish floor surfaces scheduled as concrete finish walking surfaces, or floor surfaces scheduled to receive floor covering. Trowel finished surfaces shall be true planes within 1/8 inch in 10 feet as determined by a 10 foot straightedge placed anywhere on the slab in any direction.

C. Smooth trowel finish after the surface is screeded and floated. Start troweling when all water has disappeared from the surface to first level the surface, then start final troweling when concrete has set where it no longer shows indentation from finger pressure. Trowel to a hard, smooth surface free of marks. Dusting of cement or cement and sand will not be permitted.

D. Interior floors, with concrete finish scheduled, shall receive an application of hardener compound applied according to manufacturer's published instructions. Concrete surfaces to receive ceramic floor tile or brick shall receive float finish.

3.11 FINISHES FOR GRADE BEAMS

A. Exposed grade beam faces shall have a smooth form finish obtained by using selected form facing plywood, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed. Provide grout cleaned finish consisting of 1 part Portland Cement to 1-1/2 parts fine sand by column, and mix with water to the consistency of thick paint. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that the final color of dry grout will closely match adjacent concrete surfaces.

B. Thoroughly wet concrete surfaces and apply grout immediately to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

END OF SECTION

SECTION 03 62 00 NON-SHRINK GROUTING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

1.02 REFERENCES

CRD-C621 – Specification for Non Shrink Grout Packaged Dry, Hydraulic-Cement Grout.

ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

1.03 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.04 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

PART 2 - PRODUCTS

2.01 GROUT

A. Grout: Flowable, non-shrink, non-metallic in accordance with CRD-C-621 and ASTM C1107.

B. Compressive Strength: 5,000 psi minimum at 28 days.

2.02 WATER

A. Water: Clean, potable water.

PART 3 - EXECUTION

3.01 HANDLING

A. Store and protect from moisture and contamination.

3.02 PREPARATION

A. Remove foreign materials including mud and dirt from areas to be grouted.

B. Use forms to contain grout. Forms shall be a minimum of 1½ inches larger on all sides than the item grouted.

3.03 MIXING

A. Mix grout to its fluid, self-leveling consistency in accordance with manufacturer's recommendations. Mix grout in a paddle-type mortar mixer; do not mix by hand.

B. Do not retemper grout. Do not exceed manufacturer's maximum limit on water content or use at a consistency that produces free bleeding.

3.04 PLACEMENT

A. Consolidate to provide grout uniformity. Do not vibrate grout.

3.05 PROTECTION

A. Protect grout and areas to be grouted from excessive heat and cold in accordance with manufacturer's Specifications. Protect grout from excessive drying shrinkage resulting from wind or direct sunlight. Protect areas grouted from excessive vibrations.

END OF SECTION

SECTION 05 12 00 STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 05 21 00 – Steel Joist Framing.

C. Section 05 31 00 – Steel Decking.

1.02 REFERENCES

A. AISC – Steel Construction Manual, 13th Edition.

B. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

C. AISC 341-05 – Seismic Provisions for Structural Steel Buildings, including Supplement No. 1 dated 2006.

D. AISC 360-05 – Specification for Structural Steel Buildings.

E. AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts prepared by the Research Council on Structural Connections.

F. AWS D1.1 – Structural Welding Code.

G. AWS A5.1 – Specification for Carbon Steel Electrodes for Shield Metal Arc Welding.

H. AWS A5.5 – Specification for Low-Alloy Steel Covered Arc Welding Electrodes.

I. AWS A5.17 – Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.

J. AWS A5.20 – Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.

K. SSPC – Steel Structures Painting Manual.

L. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

M. ASTM A36 – Standard Specification for Carbon Structural Steel.

N. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

O. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

P. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

Q. ASTM A325 – Standard Specification for Structural Bolts, Heat Treated, 120/105 KSI Minimum Tensile Strength.

R. ASTM A490 – Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 KSI Minimum Tensile Strength.

S. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

T. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

U. ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts

V. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium Vanadium Structural Steel.

W. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

X. ASTM A992 – Standard Specification for Structural Steel Shapes.

Y. ASTM F436 – Standard Specification for Hardened Steel Washers.

Z. ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

AA. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-Ksi Yield Strength.

BB. ASTM F1852 – Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings:

1. Contact Structural Engineer’s Construction Administrator prior to detailing structural steel shop drawings.
2. Shop drawings shall be submitted on a 24” x 36” sheet minimum.
3. Shop drawings shall clearly indicate the profiles, sizes, ASTM Grade, spacing and locations of structural steel members, including connections, attachments, anchorages, framed openings, sizes and types of fasteners, method of tightening fasteners, cambers, and the number, type and spacing of the stud shear connectors and headed studs.
4. Beam sizes shall be shown on the erection drawings (plans).
5. Submit shop drawings for review.
6. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Maintain at construction office written welding procedures for each type of welded joint used in accordance with AWS D1.1.

D. Submit certification that the fabricator meets the required qualifications and ultrasonic testing reports for complete penetration welds. If fabricator has an independent testing agency inspect fabrication as required by these specifications, submit the name and qualifications of the independent testing agency.

E. Upon request, submit the erection sequence and procedures to be used by the steel erector.

F. Submit certification that the erector meets the required qualifications.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 FABRICATOR'S QUALIFICATIONS

A. Steel fabricator shall meet the requirements in the Structural Quality Assurance Plan in the Structural Drawings.

1.06 ERECTOR’S QUALIFICATIONS

A. Erector shall be experienced in erecting structural systems similar in complexity to this Project as evidenced by 10 completed projects.

B. Erector shall have a minimum of 5 years experience in the erection of structural steel or is an AISC Certified Advanced Steel Erector.

C. For qualification of welders, refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.07 STORAGE

A. Store materials off ground to permit easy access for inspection and identification. Store steel members and packaged items in a manner that provides protection against contact with deleterious materials.

PART 2 - PRODUCTS

2.01 ANCHOR RODS

A. Anchor Rods: Headed rod or a threaded rod with a heavy hexagonal nut and plate washer welded to the bottom of the threaded rod conforming to ASTM F1554.

B. Nuts and Washers: Two hexagonal nuts and two plate washers conforming to ASTM A36 for each anchor rod assembly.

2.02 ROLLED STEEL SHAPES, PLATES, AND BARS

A. Rolled Steel Shapes, Plates, and Bars: ASTM A36; ASTM A572, Grade 50; or ASTM A992 as indicated by the Structural Drawings. ASTM A572, Grade 50 may be substituted for ASTM A992.

2.03 ROUND STRUCTURAL STEEL TUBING

A. Round Structural Steel Tubing: ASTM A501, 36 ksi minimum yield strength.

2.04 SHAPED STRUCTURAL STEEL TUBING

A. Shaped Structural Steel Tubing: ASTM A500, Grade B, 46 ksi minimum yield strength.

2.05 NON-HIGH-STRENGTH FASTENERS

A. Non-High-Strength Bolts: ASTM A307, Grade A, 60 ksi minimum, where noted on the Structural Drawings.

B. Hardened Steel Washers: ASTM F436.

2.06 HIGH-STRENGTH FASTENERS

A. High-Strength Bolts: ASTM A325 or ASTM A490 as noted on the Structural Drawings. 3/4-inch minimum diameter.

B. Hardened steel washers shall conform to ASTM F436.

C. Spline-Type Tension Control Bolts: ASTM spline-type tension control bolts with plain hardened washers and suitable nuts are an acceptable alternate design bolt assembly.

D. Do not use load indicating washers.

2.07 STUD SHEAR CONNECTORS

A. Stud Shear Connectors: 3/4-inch diameter in compliance with AWS D1.1.

2.08 HEADED STUDS

A. Headed Studs: Comply with AWS D1.1. Provide studs with the diameter shown on the Structural Drawings.

2.09 EXPANSION ANCHORS

A. Expansion Anchors: See Structural Notes.

2.10 ADHESIVE ANCHORS

A. Adhesive Anchors: See Structural Notes.

2.11 SCREW ANCHORS

A. Screw Anchors: See Structural Notes.

2.12 WELD ELECTRODES

A. Weld Electrodes: AWS A5.1, A5.5, A5.l7, or A5.20 E-70 series low hydrogen electrodes.

B. Properly store electrodes to maintain flux quality.

2.13 PAINT

A. Oxide Primer: AISC Specifications, Code of Standard Practice, and SSPC Steel Structure Painting Manual, unless indicated otherwise.

B. Paint Primer: Free of lead and chromate and comply with State and Federal volatile organic compound (VOC) requirements.

C. Paint Primer: Compatible with finish coating.

2.14 GALVANIZE

A. Galvanized Coating: ASTM A123.

B. Galvanize Bolts, Nuts, and Washers: ASTM A153 when used to connect steel members that are specified to be galvanized.

C. Expansion Anchors, Adhesive Anchors, or Screw Anchors: Where specified to be galvanized, anchors shall be mechanically galvanized in accordance with ASTM B695, Class 65, Type I.

PART 3 - EXECUTION

3.01 GENERAL

A. Fabricate and erect structural steel in accordance with AISC Specifications and Code of Standard Practice.

B. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency at least 48 hours prior to structural steel fabrication and erection.

3.02 ANCHOR ROD SETTING

A. Provide templates for setting anchor rods. Position anchor rods by using templates with two nuts to secure in place prior to placement of concrete.

B. Do not erect steel where anchor rod nuts will not have full threads.

3.03 CONNECTIONS

A. Provide a minimum of two fasteners at each bolted connection.

B. Ensure fasteners are lubricated prior to installation.

C. Provide high-strength bolted connections in accordance with AISC Specifications for Structural Joints using ASTM A325 or A490 Bolts.

D. Provide connections for expansion and contraction where steel beams connect to concrete walls or concrete columns and at expansion joints. Secure nuts on bolts against loosening. (Dent threads with a chisel.)

3.04 FASTENER INSTALLATION

A. Bolts shall be installed in holes of the connection and brought to snug tight condition. Tighten connection progressing systematically from the most rigid part to the free edges of the connection to minimize relaxation of the bolts.

B. High-strength bolts installed shall have a hardened washer under the element turned in tightening.

C. Installation and tightening of bolts shall conform to the AISC Specifications for Structural Joints.

3.05 STUD SHEAR CONNECTORS FOR COMPOSITE CONSTRUCTION

A. Stud shear connectors shall be installed in accordance with AWS D1.1 with the resulting in-place length after burn-off as shown on the Structural Drawings.

B. Stud shear connectors shall be placed as follows:

1. Studs shall be uniformly spaced along beams.
2. Locate studs directly over the web of beams with flanges less than 0.3 inches thick.
3. Minimum spacing shall be 4½ inches along the longitudinal axis of the beam and 3 inches transverse to the longitudinal axis of the beam.
4. Where double rows of studs are required, begin double rows at each end of the beam. If possible, locate the studs at least 2 inches from the edge of the flange to the centerline of stud, but in no case locate the stud less than 1-1/4 inches from the edge of the flange to the centerline of stud.
5. Refer to the Structural Drawings for additional placement guidelines.

C. Remove ceramic arc shields after welding studs.

3.06 HEADED STUDS

A. Headed studs shall be installed in accordance with AWS D1.1 with the resulting in-place length after burn-off as shown on the Structural Drawings.

B. Do not locate headed studs closer than 1-1/4 inches from the edge of embedded steel member to the centerline of the stud.

C. Remove ceramic arc shields after welding studs.

3.07 EXPANSION ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation and the ICC ESR report for the particular anchor used.

B. Minimum Embedment: See Structural Notes on Drawings.

3.08 ADHESIVE ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation and the ICC ESR report for the particular anchor used.

B. Minimum Embedment: See Structural Notes on Drawings.

3.09 SCREW ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation and the ICC ESR report for the particular anchor used.

B. Minimum Embedment: See Structural Notes on Drawings.

3.10 WELDING

A. Comply with AWS D1.1. Use prequalified weld procedures.

B. Provide end returns where fillet welds terminate at ends or sides. Returns shall be continuous for a distance of not less than two times the nominal size of the weld.

C. Complete penetration joints shall be backgouged to sound metal before the second side is welded or have 1/4-inch root opening with 3/16 x 1 inch backing bar. Access holes are required. Filling access holes is not required.

D. Remove all slag and weld splatter from deposited weld metal.

3.11 SPLICING

A. Splice members only where indicated unless authorized in writing by Structural Engineer.

B. Provide shim plates at bottom flange splice at continuous beam splices with different depths.

3.12 CUTTING

A. Do not use flame cutting to correct errors unless authorized in writing.

B. Re-entrant corners shall have a minimum radius of one inch and be free of notches. Notches and gouges resulting from flame cutting shall be finished to a smooth appearance.

3.13 MILL SCALE

A. Remove loose mill scale.

3.14 BOLT HOLES

A. Cut, drill, or punch holes perpendicular to metal surfaces. Do not enlarge holes by burning. Drill or punch holes in bearing plates. Remove burrs.

3.15 PAINTING

A. Paint steel that is not encased in concrete, plaster, or sprayed fireproofing. Do not shop paint in areas to be field welded, contact surfaces of slip critical connections, or areas to receive special finishes.

B. Field paint as required steel that has been welded or that is unpainted after connections have been tightened.

3.16 GALVANIZING

A. Galvanize shelf angles that support the exterior building veneer, for example brick shelf angles.

B. Galvanize environmentally exposed steel, for example mechanical equipment supports.

C. Touch-up welds and abrasions in galvanized members in accordance with ASTM A780.

END OF SECTION

SECTION 05 41 00 COLD-FORMED EXTERIOR STEEL STUD FRAMING

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections.

B. Section 05 40 00 – Cold-Formed Steel Framing.

1.02 REFERENCES

A. AISI S100-07 – North American Specification for the Design of Cold-Form Steel Structural Members.

B. AISI S200-07 – North American Standard for Cold-formed Steel Framing – General Provisions.

C. ANSI Z49.1 – Safety in Welding, Cutting, and Allied Processes.

D. ASTM A653 – Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

F. AWS D1.3 – Structural Welding Code: Sheet Steel.

G. SSMA – Steel Stud Manufacturers Association Product Technical Information.

1.03 DESIGN REQUIREMENTS

A. Design of the following is the sole responsibility of the Contractor:

1. Cold-formed exterior steel studs including tracks, bridging, and window or door framing.
2. Any required temporary and permanent restraint/bracing.

B. Cold-formed exterior steel stud framing shall be designed by a Structural Engineer licensed in the Project state. Design criteria includes, but not limited to, the following:

1. Deflection of steel studs shall not exceed L/360.
2. Wind pressure for Components and Cladding as indicated in the Structural Notes.

C. Cold-formed steel design, fabrication and erection shall conform to AISI S100 and AISI S200.

D. Stud depth, layout and configuration of cold-formed exterior steel studs shall be compatible with the plans, sections, and details of the Construction Documents.

1.04 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings

1. Shall include the following:
   a. Plans, cross-sections, or elevations as necessary to adequately depict component locations.
   b. Connection details showing screw types and locations, weld lengths or other fastener requirements.
   c. Bracing locations and details. Any required bracing to the primary structure that is not shown in the Construction Documents shall be specifically identified.
2. Design loads.
3. Shall be sealed by an Engineer licensed in the Project state.

C. Submit manufacturer's product information clearly describing quality, performance and finish for steel studs.

D. Submit manufacturer and Installer qualifications.

1.05 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of three years documented experience in the manufacturing of products required by the Construction Documents.

B. Installer shall have a minimum of three years documented experience.

1.06 MOCKUP

A. Provide a minimum of one mockup of exterior wall framing sufficient in size to illustrate various construction conditions and as directed by the Architect. Construct mock-up to include, but not be limited to, the following components:

1. Stud framing, including runners, bridging, outlet box framing and other farming accessories. Include interior and exterior corner conditions, and intersections with interior rated stud walls.
2. Typical window frame, door frame and expansion joint.
3. Insulation, sheathing and vapor retarder.

B. The approved sample will serve as the standard of quality, as well as for coordination with related components.

C. Leave approved mock-up ready to receive insulated metal panel mock-up.

D. Do not place mock-up to remain as a part of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Studs and accessories which are 12, 14, or 16 gage shall meet the requirements of ASTM A446, Grade D with a minimum yield of 50,000 psi. Studs and accessories which are 18 or 20 gage shall meet the requirements of ASTM A446, Grade A with a minimum yield of 33,000 psi.

B. Studs and accessories shall have a G60 galvanized coating meeting the requirements of ASTM A525.

2.02 ACCESSORIES

A. Bridging: 1-1/2-inch deep by 16 gage minimum.

B. Strap Bracing: Minimum of 1-1/2-inch wide by 18 gage unless noted otherwise.

C. Tracks: Deep leg type, unpunched, same gage, size, and finish as studs with minimum 18 gage thickness.

D. Compensation Tracks / Slip Tracks: Deep leg type with a flange width of 2½ inches. Track shall be same nominal depth as stud/track with allowance for slip of standard deep leg track. Minimum 14 gage.

E. Plates, Gussets, Clip Angles: Minimum 14 gage. Clip angles shall be a minimum of 2 inches x 2 inches.

F. Self-drilling, Self-tapping Screws: Hot-dip galvanized conforming to values given in the referenced SSMA document.

G. Anchorage Devices:

1. Powder Actuated Fasteners shall be manufactured from AISI 1062 or AISI 1065 steel austempered to a minimum core hardness of 50-54Rc and possess the following properties:
   a. Tensile strength = 270,000 psi
   b. Shear strength = 162,000 psi
   c. All fasteners shall meet the requirements of ASTM B-633-78.
   d. Fasteners shall be a minimum 9/64-inch diameter.
   e. Fasteners shall be zinc plated.
   f. Fastener minimum design values shall be in accordance with manufacturer's recommendations.
2. Expansion anchors shall be stud type, and shall be zinc plated in accordance with ASTM B633, Type III Fe/Zn 5. Expansion anchors shall be a minimum of 3/8-inch diameter with 2-1/2 inch embedment into concrete unless noted otherwise in the Drawings.

H. Welding: AWS D1.3-8 Structural Welding Code-Sheet Metal (field welding of material shall not be permitted for 20 gage material or thinner).

I. Acoustical Sealant: USG, or approved equal.

J. Sizes and thicknesses are minimum acceptable, regardless of load. Actual sizes shall be determined by Steel Stud manufacturer in accordance with loads given in the Structural Notes. Minimum listed size shall not be construed to be the actual designed component size.

PART 3 - EXECUTION

3.01 ERECTION

A. General:

1. Framing components shall be cut squarely for attachment to perpendicular members or, as required, for angular fit against abutting members.
2. Erect framing plumb, level, and square.
3. Studs shall be plumbed, aligned, and securely attached to the flanges or web of both the upper and lower tracks.
4. Fastening of components shall be with self-drilling screws or welds. Wire tying of components shall not be permitted. Touch-up field welds and scratched or damaged finish to studs with zinc rich paint.
5. Splices in framing components shall not be permitted other than in runner tracks.
6. Runner tracks shall be securely anchored to the supporting structure.

B. Studs Spacing: Stud manufacturer shall determine stud spacing at interior and corner zones to resist Component and Cladding Loads given in the Structural Notes. Stud spacing shall not exceed 16 inches, center-to-center, regardless of design loads.

C. Stud Tracks: Before installing stud tracks for exterior walls, apply two 1/2- inch round beads of acoustical sealant longitudinally under stud tracks to seal runner to floor.

D. Door Openings: Install multiple studs each side of door openings as required to resist design loads.

1. Install multiple studs horizontally between door jambs at top of doors as required to resist design loads.
2. On top of headers, install runners to receive bottom ends of studs over door openings.

E. Window Openings: Install multiple studs each side of window openings as required to resist design loads.

1. Install multiple studs horizontally between window jambs to form sills and headers as required to resist design loads.
2. Install multiple studs horizontally between window jambs to form sills and headers as required to resist design loads.
3. On top of headers and bottom of sills, install runners to receive short studs.
4. Attach blocking to stud framing with 1/2-inch diameter galvanized bolts 12 inches on-center. Coordinate attachment of window system to blocking/stud framing prior to erection of metal stud framing.
5. Where indicated on the Structural Drawings (for example, at windows over 8 feet wide and at cantilevered parapets), attach studs / track to structural steel reinforcement with self-drilling screws.

F. Corners: Construct using a minimum of three studs designed to resist the design loads.

G. Between Studs: Install framing for attachment of electrical boxes, mechanical and for other items to be anchored to walls.

H. At Butting Walls: Place studs not more than 2 inches from walls.

I. Insulation: In all multiple jamb studs and multiple headers not accessible to insulation contractors, insulation equal to that specified elsewhere shall be provided.

END OF SECTION

SECTION 05 50 00 METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Steel ladders.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Shelf angles.
5. Steel framing and supports for mechanical and electrical equipment.
6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
7. Miscellaneous metal trim.
8. Pipe guards.
9. Pipe bollards.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.
2. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.

1.03 SUBMITTALS

A. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

1.04 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.05 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 FERROUS METALS

A. Retain material types, qualities, and grades below that are indicated in Specifications or on Drawings for each fabrication type. Add or delete to suit Project.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

E. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.04 FASTENERS

A. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

B. Anchor Bolts: ASTM F 1554, Grade 36.

C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

D. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

E. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

F. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

G. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.07 STEEL LADDERS

A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.

1. Comply with ANSI A14.3, unless otherwise indicated.

B. Siderails: Continuous, 1/2-by-2-1/2-inch (12-by-64-mm) steel flat bars, with eased edges, spaced 18 inches (457 mm) apart.

C. Bar Rungs: 3/4-inch- (19-mm-) diameter steel bars, spaced 12 inches (300 mm) o.c.

D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.

F. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

G. Provide safety-cage as shown on drawings.

2.08 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.09 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

2.10 SHELF ANGLES

A. Retain this Article for angles supported from concrete frame. Angles connected to structural-steel framing are specified with that work in another Division 5 Section.

B. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

C. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. General: Provide steel framing and supports indicated and as necessary to complete the Work.

C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
3. Furnish inserts if units must be installed after concrete is placed.

D. Fabricate supports for operable partitions as follows:

1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

2.13 PIPE BOLLARDS

A. 8-inch round extra strong steel pipe 1/2-inch thick, 36KSI. Form bent corners to the radius shown without causing grain separation or otherwise impairing the Work.

2.14 PIPE RAILINGS

A. Fabricate railings and posts from 1-1/4 inch round tube steel, ASTM A 53, Type E or S, Grade A, Schedule 40. Shop prime after fabrication. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise shown.

B. Welded Connections: Cope intersections of rails and posts, weld joints and grind smooth. Butt weld end-to-end joints of railings or use welding connectors, at fabricator's option. At connections to steel supports, weld post directly to steel supports, unless otherwise indicated.

C. Anchorage: Use type of bracket with pre-drilled hole for exposed bolt anchorage. For stud partitions and framing use lag bolts set into wood backing between studs and framing members. Coordinate with stud installations for accurate location of backing members.

D. Expansion: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

2.15 CAST-IRON DOWNSPOUT SHOE

A. Provide cast-iron downspout shoe with brass cleanout where indicated on the drawings and shall be “NEEHAH” R-4929 or equivalent.

2.16 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.”
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.18 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.19 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.02 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.

1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.

3.04 INSTALLING THRESHOLDS

A. Install with anchorage system indicated to comply with manufacturer's written instructions.

B. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

3.05 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) greater than OD of bollard. After bollards have been inserted into holes, fill annular space surrounding bollard solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

C. Anchor bollards in place with concrete footings. Support and brace bollards in position in footing excavations until concrete has been placed and cured.

D. Anchor bollards to existing construction with postinstalled anchors and bolts. Provide four 3/4-inch (19-mm) anchors at each bollard, unless otherwise indicated. Embed anchors at least 4 inches (100 mm) in existing concrete.

E. Anchor internal sleeves for removable bollards in concrete by inserting into pipe sleeves preset into concrete. After internal sleeves have been inserted, fill annular space between sleeves solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward internal sleeve.

1. Place removable bollards over internal sleeves and secure with 1/2-inch (12-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.

F. Fill bollards solidly with concrete, mounding top surface.

1. Do not fill removable bollards with concrete.

3.06 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 05 51 00 METAL STAIRS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Metal stair work shall include, but not be limited to the following:

1. Steel framed stairs.
2. Steel tube handrails.
3. Steel tube wall rails.
4. Supplementary items required for proper installation.

B. Related Work Described Elsewhere:

1. Concrete Fill for Treads and Landings: Section 03 30 00.
2. Structural Steel Framing: Section 05 12 00.
3. Miscellaneous and ornamental metals: Section 05 50 00.
4. Painting other than shop priming: Section 09 90 00.

1.02 QUALITY ASSURANCE

A. Comply with the provisions of the following standards and Specifications:

1. American Institute of Steel Construction (AISC) "Specification for the Design, Fabrication and Erection of Structural Steel Specification, " 1978 Edition.
2. The National Association of Architectural Metal Manufacturers (NAAMM), "Metal Stairs Manual", 1974 Edition.
3. American Welding Society (AWS) Standard D1.1-9\80.

1.03 SUBMITTALS

A. Submit shop drawings for fabrication and erection of stair work. Include plans and elevations at not less than 1/2 inch to 1'-0" scale. Show members sizes and thicknesses, anchorage locations and accessory items. Furnish setting diagrams for anchorage installation as required.

B. Test Data: Submit certified test results or calculations indicating compliance with Uniform Load Capacity, and Safety of Design. Reports shall be compiled by a recognized independent testing agency. Design entire assembly to support a minimum live load of 100 lbs./sq.ft.

C. Having on file calculations for the architect and all governmental agencies having jurisdiction justifying structural design and sizes of members.

1.04 WARRANTY

A. Provide American Stair Corporation's standard warranty covering defects in materials and workmanship for the life of the building.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on SpeedStair manufactured by American Stair Corporation, Inc., One American Stair Plaza, Willow Springs, IL 60480. Tel. (312) 839-5880.

B. Equivalent products by the following manufacturers are acceptable:

1. ALFAB, Inc., P.O. Box 311327 Enterprise, AL 36331. Tel. (334) 347-9516.
2. Sharon Stairs, 959 Lake Road, Medina, OH 44256. Tel. (800) 792-0129.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures

2.02 MATERIALS

A. For fabrication of steel stair work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove blemishes by grinding and/or welding and grinding prior to cleaning, treating and application of surface finished.

B. Structural Steel Plates, Shapes and Bars: ASTM A36.

C. Hot Rolled Carbon Steel Sheets and Strips: ASTM A570.

D. Steel Tube/Pipe: ASTM A53, Type S, Grade A and ASTM A-500-A.

E. Shop Primer Paint: Comply with Federal Specification TT-P-636.

2.03 FACTORY FABRICATED STAIRS

A. Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth, where exposed. Construct stair units to uniform to sizes and arrangements as shown. Provide metal framing, hangers, columns, railings, newels, baluster, struts, clips, brackets, bearing plates and other components for the support of stair and platforms. Erect stair work to line, plumb, square, and true with runs registering level with floor and platform levels. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the stairs on the supporting structure.

2.04 RAILINGS

A. Railings shall be fabricated of 1-5/8 inch O.D. seamless 14 gage tubing. Rail supports shall be 1-1/2 inch, 11 gage seamless tubing with closed ends. Railings and support shall be of welded flush construction with all exposed welds ground smooth. Comply with OSHA, NFPA 101 (1981), and ANSI A117.1 (1981) requirements for required loads and spacing of members.

B. Wall rail shall be of 1-5/8 inch round tubing with closed ends and return to wall. Provide either cast or wrought iron wall brackets for securing pipe handrails at stairs along wall lines. Brackets shall have rounded seat drilled for screwing from underside to handrail. Brackets shall be spaced not over 5'-0" on center, bolted to walls.

C. Provide metal escutcheon plates where handrail returns to or terminates at wall.

2.05 FABRICATION

A. Form work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to radius of approximately 1/32 inch. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

B. Weld corners and seams in accordance with recommendations of AWS. Grind these exposed welds to match and blend with adjoining surfaces.

C. Join rails and corners by mitered and welded joints made by fitting top rail and intermediate rails in a unit and bracketed, or welded to posts as indicated. Butt railing splices and reinforce by a tight fitting interior sleeve. Plumb posts in each direction. Secure posts by welding direct to stair stringers.

D. Remove scale, rust and other deleterious materials before applying shop primer. Apply one shop coat of metal primer to fabricated metal items.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide anchorage devices and fasteners where necessary for securing steel stair items to in-place construction; including threaded fasteners for concrete inserts, toggle bolts, through-bolts and other connectors as required.

B. Perform cutting, drilling and fitting required for installation of stair work. Set work in location, alignment and elevation, plumb, level and true, and free of rack measured with approved shop drawings.

END OF SECTION

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concealed wood grounds and blocking to frame openings, form terminations, to provide anchorage and / or support of other interior and exterior locations; plywood, particleboard, furring channels and rough hardware.

1.02 RELATED SECTIONS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 06 40 00 - Architectural Woodwork.

1.03 COORDINATION

A. Fit carpentry Work to other Work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other Work.

1.04 QUALITY CONTROL

A. Factory mark each piece of lumber and plywood to identify the type, grade, agency providing the inspection service, the producing mill and other qualities as specified.

1.05 DELIVERY, STORAGE AND PROTECTION

A. Keep materials dry during delivery and storage. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks. Protect installed carpentry work from damage by work of other trades until Owner's acceptance of the Work. Contractor shall comply with manufacturer’s required protection procedures.

1.06 PROJECT CONDITIONS

A. Installer must examine all parts of the supporting structure and the conditions under which the carpentry Work is to be installed, and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

PART 2 - PRODUCTS

2.01 LUMBER

A. For each use, comply with the "American Softwood Lumber Standard" PS 20 by the U.S. Department of Commerce. Nominal sizes are shown or specified; provide actual sizes complying with the minimum size requirements of PS20 for the moisture content specified for each use. Provide dressed lumber, S4S, unless otherwise shown or specified. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and complying with dry size requirements of PS 20, unless otherwise specified.

2.02 FRAMING LUMBER

A. Where wood framing is shown or scheduled, provide lumber complying with grading rules which conform to the requirements of the "National Grading Rule for Dimension Lumber" of the American Lumber Standards Committee established under PS 20.

B. For Light Framing: Standard Grade.

C. For Structural Framing: (4 inches and wider and from 2 inches to 4 inches thick), provide the following: No. 1 Grade; Douglas Fir (WCLB or WWPA), Southern Pine (SPIB). Fb (minimum extreme fiber stress in bending); 1,250 psi. E (minimum modulus of elasticity); 1,700,000 psi.

2.03 BOARDS

A. Where lumber less than 2 inches in nominal thickness and 2 inches or more in nominal width is shown or specified, provide boards complying with dry size requirements of PS 20.

B. Concealed Boards: Where boards will be concealed by other work, provide the following:

1. Moisture Content: 19 percent maximum, mark boards "S- Dry".
2. Species and Grade: Provide one of the following:
   a. Southern Pine (SPIB) No. 2 boards.
   b. WCLB (any species) No. 3 boards.

2.04 PLYWOOD

A. For each use, comply with the requirements for "Softwood Plywood/Construction and Industrial" PS 1 by the U.S. Department of Commerce.

B. Concealed Plywood: Where plywood will be concealed by other work, provide 5/8-inch minimum thickness Interior Type plywood C-D Plugged Grade, unless otherwise specified or shown on Drawings. For backing panels for electrical or telephone equipment, provide fire-retardant treated Standard grade plywood with exterior glue.

C. Exposed Plywood: Where plywood will be exposed to view, provide 5/8 inch minimum thickness Interior Type plywood B-C Plugged Grade, unless otherwise specified or shown on Drawings. Unless specifically stated otherwise, all exposed plywood shall be painted or stained from standard colors as selected by Project ENGINEER / MDOT Architect.

D. Plywood Subfloor: T&G panels shall be 3/4 inch thick and comply with APA-The Engineered Wood Association rated Sturd-I-Floor, Exposure 1.

E. Particleboard: Particleboard shall be 1/2-inch thick and comply with Type PBU, ANSI standard A208.1

2.05 ANCHORAGE AND FASTENING MATERIALS

A. For each use, select proper type, size, material, and finish complying with the applicable Federal Specifications. Zinc electroplated steel fasteners for high humidity and treated wood locations. All nails shall be coated.

2.06 FURRING CHANNELS

A. “Hat-shaped”, 7/8 inch by 2-9/16 inches, cold-rolled, 20 gage, galvanized.

2.07 TREATED WOOD

A. Complete fabrication of treated items prior to treatment, wherever possible. If cut after treatment, coat cut surfaces with heavy brush coat of same fire-retardant chemical used for treatment. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

B. Preservative Treatment: Where lumber or plywood is indicated as "Treated", or is specified herein to be treated, comply with the applicable requirements of the American Wood Preservers Institute (AWPI). Mark each treated item to comply with the AWP Quality Mark requirements for the specified requirements.

1. Pressure-treat aboveground items with water-borne preservatives complying with AWPI P-2. After treatment, kiln-dry to maximum moisture content of 15 percent. Treat indicated items and the following:
   a. Wood cants, nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
   b. Wood sills, sleepers, blocking, furring stripping and similar concealed members in contact with masonry or concrete.

C. Fire-Retardant Treatment: Where "PR-S" lumber or plywood is shown or scheduled, comply with the AWPI Specification C-208 for pressure impregnation with fire-retardant chemicals to achieve a flame-spread rating of not more than 25 when tested in accordance with UL Test 723, ASTM E A4, or NFPA Test 355. Where treated items are indicated to receive a transparent or paint finish, use a fire-retardant treatment that will not bleed through or adversely affect bond of finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use only sound, thoroughly seasoned materials of the longest practical lengths and sizes to minimize jointing. Use materials free from warp that cannot be easily corrected by anchoring and attachment. Sort out and discard warped material and material with other defects that would impair the quality of the Work.

B. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

C. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

3.02 ATTACHMENT AND ANCHORAGE

A. Use common wire nails, except as otherwise shown or specified. Use finishing nails for finish Work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

B. Exposed Plywood: Panel ends and edges shall have spacing of 1/8 inch maximum, unless otherwise indicated by the panel manufacturer. Fasten 6 inches on center along supported panel edges and 10 inches on center at intermediate supports.

C. Plywood Subfloor: Fasten to supporting members using combination of glue and wood screws. Mastic construction adhesives shall comply with the APA Glued Floor System and ASTM standard D3498, Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems (based on APA Specification AFG-01). Fasten screws at 6 inches on center along all edges and 10 inches on center at intermediate supports.

D. Particleboard: Fasten to plywood subfloor using combination of glue and type A or AB, sheet metal, twin fast types and fully threaded designed for use in particleboard. Install in accordance with installation instructions of The Composite Panel Association.

E. Furring Channels: Fasten to purlins using self-drilling, self-tapping screws, Spaced at 6 inches on center.

3.03 WOOD GROUND NAILERS, BLOCKING, AND SLEEPERS

A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Set true to line and level, plumb with intersections true to required angle. Coordinate location with other Work involved.

B. Attach to substrates securely with anchor bolts and other attachment devices as shown as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Building into masonry; anchor to formwork before concrete placement.

C. Provide grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2 inch wide and of the thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.04 WOOD FURRING

A. Install plumb and level with closure strips at all edges and openings. Shim with wood as required.

B. Suspended Furring: Provide of size and spacing shown, complete including hangers and all attachment devices. Level to a tolerance of 1/8 inch in 12 feet.

3.05 WOOD FRAMING

A. Set wood framing accurately to required lines and levels. Provide framing members of sizes and on spacing shown, and frame openings as shown, or if not shown, comply with the recommendation of the "Manual for Housing Framing" of the National Forest Products Association. Cut, join, and tightly fit framing around other Work. Do not splice structural members between supports unless otherwise detailed.

B. Anchor and nail as shown, or if not shown, to comply with the "Recommended Nailing Schedule - Table 1 of the "Manual of House Framing" and other recommendations of the N.F.P.A.

END OF SECTION

SECTION 06 40 00 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Architectural woodwork as shown on the Drawings and schedules. Architectural woodwork is defined to include (in addition to items so designated on the Drawings) miscellaneous exposed wood members commonly known as "Finish Carpentry" or "Millwork", except where specified under another Section of these Specifications.

B. The types of architectural woodwork include, but are not limited to:

1. Standing and Running Trim.
2. Cabinets with stain or for paint finish.
3. Countertops.
4. Shelving.
5. Hardware.
6. Miscellaneous work.

1.02 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications.

B. Section 06 10 00 – Rough Carpentry.

C. Section 09 05 15 – Color Design.

D. Section 09 90 00 – Painting and Coating.

1.03 DEFINITIONS

A. Terms used in this Section are in accordance with terminology of the Architectural Woodwork Institute, Architectural Woodwork Quality Standards, Eighth Edition, Version 1.0, 2003.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, specifications, and installation instructions for each item of Factory-fabricated woodwork prior to fabrication.

B. Shop Drawings: Submit Shop Drawings showing location of each item, including Lumber, Panel Products, Standing and Running Trim, Cabinets, Countertops, Shelving, and miscellaneous work. Dimensioned plans and elevations shall be provided and drawn at a minimum scale of 1/2 inch = 1'-0". Large scale details shall be provided and drawn at a minimum scale of 3 inches = 1'-0". Shop drawings shall clearly indicate location of joints, countertops, grommets, plastic laminates, brackets, hardware, metal finishes, attachment devices and other materials necessary for complete fabrication.

1.05 QUALITY ASSURANCE

A. Comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards". All construction, fabrication, finishes, and materials shall meet AWI Premium Quality Standards.

B. Quality Marking: Mark each unit of architectural woodwork with mill's or fabricator's identification and grade marks, located on surfaces which will not be exposed after installation.

C. The millwork manufacturer shall :

1. Have a minimum of five (5) years documented experience and shall have completed projects of similar scope and size to the work of this project.
2. Have technologically advanced woodworking facilities employing the use of modern equipment and techniques for fabricating and finishing to meet the level of quality for the manufacture of all fabrication specified.
3. Employ skilled workmen experienced in the fabrication and finishing of premium quality millwork.
4. Be responsible for fabrication, finishing and installation of all products and procedures specified in this Section.

D. For the following types of architectural woodwork, comply with the indicated standards as applicable:

1. Lumber: AWI Section 100.
2. Standing and running trim: AWI Section 300.
3. Cabinets and Countertops: AWI Section 400, A, B, C.
4. Shelving: AWI Section 600.
5. Miscellaneous work: AWI Section 700.
6. Finishing: AWI Section 1500.
7. Installation of woodwork: AWI Section 1700.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration. Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.07 PROJECT CONDITIONS

A. The Installer shall examine the substrates and conditions under which the work is to be installed; and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Conditioning: The Installer shall advise the Contractor of temperature and humidity requirements for woodwork installation areas. Do not install woodwork until the required temperature and relative humidity have been stabilized and will be maintained in installation areas.

C. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0-percent tolerance of the optimum moisture content, from the date of installation through the remainder of the construction period. The fabricator of the woodwork shall determine the optimum moisture content and required temperature and humidity conditions.

1.08 COORDINATION

A. Coordinate the work of this Section with work of other Sections that require penetrations, attachments, or supports for architectural woodwork.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Except as otherwise indicated, comply with the following requirements for architectural woodwork not specifically indicated as pre- fabricated or pre-finished standard products.

B. Wood Moisture Content: Provide kiln-dried lumber and maintain optimum 8 to 13 percent range (damp region) moisture content in solid wood (hardwood and softwood) through fabrication, installation, and finishing operations of interior Work.

C. Wood for Painted Finish: Comply with AWI quality standards for selection of species, grade and cut (fabricator's option, except as otherwise indicated). Wood for trim shall be maple or other closed-grain hardwood subject to Project Engineer / MDOT Architect's prior approval.

D. Wood for Stained Finish: Comply with AWI quality standards for selection of species, grade and cut.

E. Plastic Laminate: Comply with NEMA LD3; type, thickness, color, pattern and finish as indicated for each application. Refer to Section 09 05 15 - Color Design for selection of manufacturer, color and finish.

F. Design and Construction Features: Comply with the details shown for profile and construction for architectural woodwork; and where not otherwise shown, comply with applicable AWI Quality Standards, with alternate details at fabricator's option.

G. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, wherever possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth the edges of cut outs and where located in countertops and similar exposures, seal the edges of cut outs with a water resistant coating.

H. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit. Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication (without field measurements) and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

2.02 ARCHITECTURAL WOODWORK TYPES

A. Wood cabinets: Fabricate millwork in accordance with AWI Premium Standards, Section 400 Cabinets and as indicated on the Drawings. On exposed portions provide solid wood and plywood (no plywood substitutes) meeting the requirements for the specified AWI Quality Grade.

1. Exposed surfaces: Birch.
2. Semi-Exposed surfaces: Birch.
3. Concealed surfaces: Birch.

B. Plastic Laminate Colors and Patterns: As selected by the Project Engineer/MDOT Architect from manufacturer's standard products, satin finish (5-34 reflectance).

2.04 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units that are specified as "door hardware" in other sections of these specifications. Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware." Unless shown or noted otherwise, cabinet hardware shall comply with the following:

1. Hinges: Concealed type equal to Blum No.125 Series using full side adjustment.
2. Pulls: Wire type equal to Stanley No. 4484.
3. Grommets: 2 inches diameter molded plastic grommet liner with cap.
4. Drawer guides: Equal to K&V No. 1300.
5. Adjustable shelf hardware (side support) equal to K&V No. 255-256.
6. Adjustable shelf hardware (back support) equal to K&V No. 87-24 and No.187-16 for 16 inches deep shelves.
7. Adjustable shelf hardware (back support) equal to K&V No. 82-48 and No.182-20 for 20 inches deep shelves complete with fasteners and optional accessories.
8. Hardware finishes to be selected by the Project Engineer / MDOT Architect.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of the time substrates are to be built. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

A. All work shall be installed in strict accordance with the premium grade standards of Section 1700 – Installation of woodwork of AWI Quality Standards.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8 feet for plumb and level (including countertops); and with 1/16-inch maximum offsets in revealed adjoining surfaces. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Secure woodwork with anchors or blocking built-in or directly attached to substrates. Attach to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where pre-finished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

D. Casework: Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, and comply with AWI Quality Standards for joinery.

F. Countertops: Anchor securely to base units and other support systems as indicated.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth ready for painted or stained finishes.

3.04 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

A. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

B. Clean hardware, lubricate and make final adjustments for proper operation. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

C. Refer to Section 09 90 00 for final finishing of installed painted and stained architectural woodwork.

D. Protection: The Installer of architectural woodwork shall advise the Contractor of final protection and maintenance conditions necessary to ensure that the Work will be without damage or deterioration at the time of acceptance.

END OF SECTION

SECTION 07 21 00 THERMAL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Thermal insulation for exterior walls, interior walls, and ceilings as shown on the Drawings and specified herein.

1.02 RELATED SECTIONS

A. Other types of insulation are specified in Roof Insulation under Section 13 34 19 Metal Building System Specifications.

1.03 SUBMITTALS

A. Submit manufacturer's product and technical data for each type of insulation describing location, extent, material and method of fastening prior to installation for Project Engineer / MDOT Architect's approval.

1.04 PRODUCT HANDLING

A. Protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs or replacements as necessary.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. CertainTeed Corporation, Valley Forge, PA, Tel. (800) 233-8990.
2. Johns Manville Corp, Denver, CO, Tel. (303) 978-2531.
3. Knauf Insulation, Shelbyville, IN, Tel. (800) 825-4434.
4. Owens Corning, Toledo, OH, Tel. (800) 438-7465.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 BATT INSULATION

A. Provide glass fibers and resinous binders formed into flexible batts conforming to ASTM C 665, Type III, Class B with density not less than 1.5 lbs. Per cubic foot and an R value of 3.17 per inch of thickness at 75 degrees F. mean temperature, with aluminum foil and asphalt vapor barrier laminated to one face. Thickness of insulation shall be as shown on the Drawings.

2.03 SOUND ATTENUATION INSULATION: Similar to above specified insulation except manufacturer's standard unfaced batt insulation manufactured for sound attenuation.

2.04 ACCESSORIES

A. Tape: Bright aluminum, self-adhering type, mesh reinforced, two inches wide.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions where building insulation is to be installed and notify the Project Engineer / MDOT Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Project Engineer / MDOT Architect.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for the particular condition of installation in each case. If printed instructions are not available, or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections, which interfere with placement.

C. Apply a single layer of insulation to the required thickness, unless a double layer is required, to make up the total thickness shown.

D. Set vapor barrier faced units with vapor barrier to inside of construction, except as otherwise shown. Do not obstruct ventilation spaces. All joints at vapor barriers shall be sealed with 4 inches wide, foil faced duct tape to prevent vapor and air migration.

E. Tape joints and ruptures in vapor barriers, using tape specified above, and seal each continuous area of insulation to surrounding construction so as to ensure vapor tight installation of the units.

F. Where insulation is impaled on stick clips, provide clips not less than 3 inches from corners or edges and not more than 12 inches on center.

G. Adhesive Application - per manufacturer's printed directions. Apply adhesive over entire back of insulation and on edges of insulation, except as noted below.

H. Fastener Installation - per manufacturer's printed directions. Install fasteners 12 inches on center each way. Use adhesive as specified herein per fastener manufacturer's recommendations.

3.03 BATT INSULATION

A. Install blanket fiberglass insulation with edges closely butted. Cut and fit insulation to closely fit intersecting or penetrating surfaces.

B. Walls: Install sound batt insulation between the studs at all interior partitions. Attach to studs with staples, adhesive or method as recommended by manufacturer. Tape and seal small joints and punctures and replace insulation where large tears occur.

C. Ceilings: Install above ceilings continuous with vapor barrier down. Lay above gypsum board at bottom chord of wood trusses in method recommended by manufacturer. Tape and seal small joints and punctures and replace insulation where large tears occur.

END OF SECTION

SECTION 07 21 28 CELLULOSE THERMAL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building insulation for exterior and interior walls

1. Pneumatically sprayed damp into open wall cavities.

1.02 RELATED SECTIONS

A. Section 13 34 19 Metal Building Systems for thermal glass-fiber blanket insulation.

1.03 SUBMITTALS

A. Submit manufacturer's product and technical data for insulation describing location, extent, material and method of application prior to installation for MDOT Architect's acceptance.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of Cellulose Thermal Insulation with 10 years minimum experience.

B. Installer: Company specializing in Cellulose Thermal Insulation Products, with 5 years minimum experience, who has completed work similar to that indicated for this project and with a record of successful in-service performance and is approved by manufacturer to install manufacturer's products. Submit identification of at least 3 projects of similar scope and complexity along with name, address, and telephone number of the Architect, Owner and General Contractor.

1.05 PRODUCT HANDLING

A. Protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs or replacements as necessary.

1.06 WARRANTY

A. Provide manufacturer's standard life time warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by NU-WOOL Company, Inc., 2472 Port Sheldon Street, Jenison, MI. Tel. (800) 748-0128.

B. Equivalent products by the following manufacturers are acceptable:

1. Fiberlite Technologies, Inc., Joplin, MO. Tel: (800) 641-4296.
2. Hamilton Manufacturing Inc., Twin Falls, Idaho. Tel: (208)733-9689.

C. Alternate Manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 62 14-Product Options and Substitution Procedures.

2.02 CELLULOSE INSULATION MATERIALS

A. Cellulose Insulation: Insulation shall be manufactured from recycled newspapers containing a minimum of 85 percent paper fiber content. Fibers shall be treated with boric acid and sodium polyborate (ammonium or aluminum sulfate are NOT allowed) to create permanent flame resistance and shall contain a EPA registered fungicide, be mold-resistant, non-toxic, non-corrosive, shall not irritate normal skin, shall not give off odor during or after installation, shall not attract vermin or insects and shall not adversely affect other building materials.

B. Thermal Performance: Cellulose insulation shall resist the flow of heat. Heat transfer is limited as indicated by its R-Value of 3.8 per inch. Air infiltration through the material shall be limited by the density of the material and methods used to install it.

C. Sound Control: Cellulose insulation shall provide significant noise reduction in walls and floors.

D. Standards: Cellulose insulation shall conform to the CPSC standard 16 CFR Parts 1209 and 1404. In addition, the cellulose insulation shall meet or exceed all of the test requirements of ASTM C-739, E-84 and E-119, and UL-723.

2.03 MATERIAL CHARACTERISTICS

A. The following properties were tested by Underwriters Laboratories (R-8078):

1. Settled Density: The maximum density after long-term settling of dry application: 1.6 lb/ft©.
2. Thermal Resistance: The average thermal resistance per inch: 3.8 (R-Value/in).
3. Flammability Characteristics**:** Critical Radiant Flux - greater than or equal to 0.12 watts/cm2; Smoldering Combustion - less than or equal to 15 percent.
4. Moisture Vapor Sorption**:** This requirement assures that normal variations in relative humidity will not adversely affect thermal resistance. Cellulose insulation shall meet the requirements of less than 15 percent for maximum weight gain under the specified test conditions.
5. Surface Burning Characteristics: Flame Spread – 15; Smoke Developed – 5.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions where building insulation is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for the particular condition of installation in each case. If printed instructions are not available, or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.

B. Extend insulation full thickness as shown over entire area to be insulated. Fit tightly around obstructions, and fill voids with insulation. Remove projections, which interfere with placement.

C. Nu-Wool Insulation: Cellulose insulation shall be pneumatically blown dry into floor assemblies after mechanical, plumbing, electrical and other utility installations have been completed and in compliance with manufactures instructions.

D. Nu-Wool WALLSEAL: Cellulose insulation shall be pneumatically sprayed with a controlled water fog for adhesion into open wall cavities after mechanical, plumbing, electrical and other utility installations have been completed. Drywall may be installed 24 hours after application. Total drying time is approximately 30 days. Installation shall be made only by Nu-Wool factory-certified WALLSEAL contractors using approved equipment.

END OF SECTION

SECTION 07 26 00 VAPOR RETARDERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vapor retarder under concrete floor slab.

B. Concrete curing paper on top of freshly poured concrete floor slab.

C. Floor protection paper used for positive protection of finished floors.

1.02 SUBMITTALS

A. Submit manufacturer's technical product data, installation instructions and recommendations for products specified.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Fortifiber Corporation, 300 Industrial Drive, Fernley, NV 89408. Tel. (800) 773-4777.

B. Equivalent products by the following manufacturers are acceptable:

1. Grace Construction Products, Cambridge, Ma. Tel: (800) 444-6459.
2. Griffolyn ® Division, Reef Industries, Inc., Houston, TX. Tel: (800) 231-6074.
3. Stego Industries LLC, San Juan Capistrano, CA. Tel: (877) 464-7834.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 VAPOR RETARDER

A. Membrane shall be a 15 mil polyolefin film meeting ASTM E-1745-97 Class A Test Method, equal to Fortifiber Corporation, Moistop® Ultra™ 15, including Moistop® tape and sealants with the following characteristics:

1. Moisture Vapor Permeance: ASTM E-154, Section 7 (E-96, Method A) = .02 Perms.
2. Tensile Strength: ASTM E-154, Section 9 (Method D-882) = (70lb f/in min)-MD & CD.
3. Puncture Resistance: ASTM D-1709, Method B = 3,000 Grams.

2.03 CONCRETE CURING PAPER

A. Laminated tri directional glass fiber reinforced long fibered kraft curing papers with double coating of high-melting-point asphalt, meeting ASTM C-171 Test Method, equal to "Orange Label Sisalkraft®".

2.04 FLOOR PROTECTION PAPER

A. Non-staining reinforced floor protection paper consisting of two heavy kraft sheets and glass reinforcing fibers laminated with a non-staining adhesive, meeting ASTM D 828 and ASTM D 781 Test Methods, equal to “Seekure®”.

PART 3 - EXECUTION

3.01 PREPARATION: Ensure items that pass through building paper / membrane are properly and rigidly installed, substrate is free of projections and irregularities that may be detrimental to proper installation of building paper / membrane.

3.02 INSTALLATION

A. Vapor Retarder: Unroll underslab vapor retarder over thoroughly compacted subgrade and turn down at inside perimeter of grade beams. Seal joints watertight, with a pressure sensitive tape as recommended by manufacturer, allowing a minimum overlap of 6 inches. Apply tape evenly over seams and rub out wrinkles formed during application. Seal pipes and conduits passing through the membrane with Moistop boot and tape. Inspect membrane thoroughly and repair all punctures immediately before placing concrete. Equipment, tools, and procedures that might puncture the membrane shall not be used while placing and finishing the concrete. Comply with manufacturer’s recommendations and installation procedures as outlined in ASTM E-1643.

B. Curing Paper: Unroll concrete curing paper over the entire surface once the concrete has set sufficiently hard to permit application without marring the surface. Lap joints 4 inches and seal with pressure sensitive tape. Apply tape evenly over seams and rub out wrinkles formed during application. Ensure that all tears or penetrations are repaired.

C. Floor Protection Paper: Apply floor protection paper immediately after floor covering is installed. Do not remove until final completion and acceptance by the Project Engineer. Lay paper in widest practical width with 6-inch laps to provide complete coverage of flooring. Seal joints with minimum 2 inch wide pressure sensitive tape.

3.03 CLEANING

A. Inspect vapor barrier membrane thoroughly and keep clean. Remove dirt, oils, mud, debris, etc. prior to placing concrete.

END OF SECTION

SECTION 07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.02 SUMMARY

A. This Section includes the following:

1. Fluid-applied membrane air barrier, vapor permeable.

B. Related Sections include the following:

1. Section 07 62 00 “Sheet Metal Flashing and Trim”.
2. Section 07 92 00 “Joint Sealants”.
3. Section 09 29 00”Gypsum Board”.

1.03 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Barrier Assembly Air Leakage: Not to exceed 0.04 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa); ASTM E 283.

1.05 SUBMITTALS

A. Product Data: Include manufacturer’s written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.

C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Preinstallation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer’s written instructions.

D. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Synthetic Polymer Membrane:

1) Grace Construction Products; Perm-A-Barrier VP (Liquid).
2) Henry Company; Air-Bloc 33 with approved primer.
3) PROSOCO, Inc.; PROSOCO R-GUARD.
4) Sto Corp.; Sto Guard.

2. Physical and Performance Properties:

a. Membrane Air Permeance: Not to exceed 0.004 cfm/ sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
b. Membrane Vapor Permeance: Not less than 4 perms (243 ng/Pa x s x sq. m); ASTM E 96.

2.02 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, crosslaminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor-retarding, 30- to 40-mil- (0.76- to 1.0-mm-) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Modified Bituminous Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Air barrier manufacturer’s glass-fiber-mesh tape.

G. Substrate Patching Membrane: Manufacturer’s standard trowel-grade substrate filler.

H. Adhesive and Tape: Air barrier manufacturer’s standard adhesive and pressure-sensitive adhesive tape.

I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.

J. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. Ft (24 to 32 kg/cu. M) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

K. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

L. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43-mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms (2145 ng/Pa x s x sq. m).

M. Elastomeric Flashing Sheet: ASTM D 2000, 2BC415 to 3BC620, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

N. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

O. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.05 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer’s written instructions.

B. Apply air barrier membrane within manufacturer’s recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.25-mm) wet film thickness.

E. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches (75 mm) onto each surface according to air barrier manufacturer's written instructions.

F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to ASTM E 783.

D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 07 42 45 ALUMINUM COMPOSITE PANEL SYSTEM

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.02 SCOPE

A. The extent of the panel system is shown on the drawings. Provide wall panels including perimeter extrusions, extruded stiffeners, rigid and batt insulation, gaskets, sealants, fasteners, related flashings, clip angles, furring and lightgage framing, sealants between wall panels and previously installed adjacent construction and other miscellaneous accessories required for a complete watertight system installation.

1.03 QUALITY ASSURANC

A. Provide a watertight and structurally sound, self-draining wall panel system with no water penetration.

B. Fabrication History: Fabricator/installer shall assume undivided responsibility for all components of the aluminum composite panel system, and shall demonstrate no less than five (5) years successful experience of metal panel work similar in scope and size to this Project.

C. Installers Qualifications: Installers management and key personnel must have five (5) years experience and show three (3) Projects successfully completed of similar magnitude and size using composite panels. Projects must have a record of successful in-service performance. The ability to secure men and equipment to do the job in a professional manner must be demonstrated.

D. Performance Requirements: Work of the Section shall conform with all applicable codes and regulations.

1. Design Criteria: Make allowances for free and noiseless vertical and horizontal thermal movement due to the contraction and expansion of component parts, for an ambient temperature range of from 20 degrees F. to plus 150 degrees F. Buckling, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement of component parts will not be permitted. Fabricator, assembly and erection procedure shall take into account the ambient temperature range at the time of the respective operation.
2. Wind Loads: Assemblies herein specified shall be designed for flexural, shear and torsional stresses for the following positive and negative wind pressures acting normal to the plane of the assemblies. Design shall be based on Building Code with a 20 PSF Design Windload and allowances for elevation, corners and all upgrade areas.
3. Seismic Forces: Seismic lateral force requirements shall comply with Uniformed Building Code (UBC) and other applicable City, County, and State Codes and Regulations. The wall is to be designed to accommodate a floor structure displacement of 0.005" per inch of floor height, to satisfy the seismic loading requirements.
4. Pressure and Load:
   a. Normal to the plane of the wall between supports, deflection of horizontal perimeter framing member shall not exceed 1/175 or span length of

3/4 inch, whichever is less.

b. At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 1/16 inch. Where connection points are not clearly defined, maximum anchor deflection shall not exceed 1/16 inch.

c. Stresses must take into account interaction and in no case shall allowable values exceed the yield stress.

d. At 1-1/2 times design pressure, permanent deflections of framing members must not exceed 1/1000 of span length, and components must not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16 inch.

e. Flatness Criteria: Maximum 1/32 inch in 2'-0" on panel in any direction for assembled units (non-accumulative).

f. General Approval: Panel manufacturer shall have in production a product having an SBCCI listing for use on non-combustible construction.

1.04 TESTS

A. Aluminum Composite Panel System: System furnished under this section shall have been tested by an independent testing laboratory. Test results shall meet or exceed the following:

1. Air Infiltration: When tested in accordance with ASTM E283-84, air infiltration at 6.4 psf must not exceed .1 cfm per square foot of wall area.

2. Water Infiltration: Water infiltration in this specification, is defined as the appearance of uncontrolled water in the wall. Provisions shall be made in the design to drain to the exterior face of the wall any leakage of water occurring at joints and/or condensation taking place within the construction. No water infiltration under static pressure with ASTM E331-83 at a differential static pressure of 6.24 psf, after 15 minutes.

3. Structural Performance: Shall be tested in accordance with ASTM E330-84 at design pressure. Deflection limitations are listed previously. After initial test, test at 150 percent of design pressure. No permanent deformation exceeding L/100 or failure to structural members allowed.

1.05 SUBMITTALS

A. Submit listings of projects of similar scope and character by installer, photographs of existing installations, pertinent catalog and calculations. Include names and addresses of architects and owners.

B. Samples: Submit 2’-0” x 2’-0” sample of panel system in specified finish complete with factory applied edge treatment, fabricated into units representative of the actual calculations.

C. Shop Drawings: Submit shop drawings showing profiles of panel units, details of forming, joint supports, anchorages, trim, flashings, furring and framing, sealants and accessories. Show details of weatherproofing at edge terminators, show elevations, and layout of entire Work.

D. Reports of Tests: SBCCI listing and test report on product submitted.

E. All drawings and calculations must be stamped by a PE registered in Mississippi.

1.06 PRODUCT HANDLING

A. After acceptance of panels on a given elevation, protection and storage shall be the responsibility of the General Contractor.

1.07 WARRANTY

A. Provide five year warranty under provisions of Section 01700. Include coverage for degradation of panel finish including color fading caused by exposure to weather, water tightness, integrity of seals, insulation and warpage.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Aluminum Composite Panels:

1. ALUCOBOND 21 aluminum composite material manufactured by Alucobond Technologies, Inc. to conform to local codes or equal acceptable manufacturers: Reynolds Metal Co. - Reynobond 4mm FR. Other equal products will be accepted subject to compliance with requirements.

B. Thickness: 4 mm (0.157")

C. Fire Performance:

1. ASTM E84-79 - Class A or I material having a maximum value of Flame Spread 15, Smoke Developed 40 when tested both as a composite panel and as the core element separately.
2. ASTM E162 - No surface flaming.
UBC 17-5 - No flame spread along interior face or penetration through the wall assembly.

D. Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781-76 (simulating resistance to panel elimination), there shall be no adhesive failure of the bond: a) between the core and the skin nor, b) cohesive failure of the core itself below the following values:

1. Bond Strength: 861 psi (Vertical Pull) ASTMC – 297
2. Peel Strength: 115N mm/mm (22.5 in lb/in) as manufactured
   a. 115N mm/mm (22.5 in lb/in) after 8 hours in water at 200 degrees F.
   b. 115N mm/mm (22.5 in lb/in) after 21 days soaking in water at 70 degrees F.

E. Finishes:

1. Coil coated KYNAR 500 or HYLAR 5000 based polyvinylidene fluoride (PVDF) resin in conformance with the following general requirements of AAMA 605.1-92.
   a. Color: Custom colors as selected by Architect/Engineer.
   b. Coating Thickness: 1.0 mil (± 0.2 mil)
   c. Hardness: ASTM D-3363; F minimum using Eagle Turquoise Pencil.
   d. Impact: Test Method: ASTM D-2794: Garnder Variable Impact Tester with 5/8" mandrel. Coating shall withstand reverse impact of 1/5"/pounds per mil substrate thickness. Coating shall adhere tightly to metal when subjected to

#6000 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.

e. Adhesion: Test Method: ASTM D-3359. Coating shall not pick off when subjected to an 11 inches x 11 inches x 1/16 inch grid and taped with #600 Scotch Tape.

f. Salt Spray Resistance: Test Method: ASTM B-117; expose coating system to 3000 hours, using 5 percent NAC1 solution. Corrosion creepage from scribe line: 1/16 inch max (1.6 mm). Minimum blister rating of 8 within the test specimen field.

2. Weather Exposure:

a. Outdoor: Five year exposure at 45 degree angle facing south Florida exposure. maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244. maximum chalk rating of 8 in accordance with ASTM D-659. No checking, crazing, adhesion loss.

b. Accelerated Aging: ASTM D-822, 5000 hours in Atlas Type Weatherometer; using cycle of 102 minutes light and 18 minutes dimensioned light and demineralized water. No check, crazing, adhesion loss or objectionable color change or chalking.

c. Chemical Resistance: ASTM D-1308 utilizing 10 percent Muriatic Acid for an exposure of 15 minutes. ASTM D-1308 utilizing 20 percent Sulfuric Acid for an exposure time of 18 hours. No loss of adhesion or gloss and no color change.

2.02 ALUMINUM COMPOSITE PANELS

A. Stiffeners: Extruded aluminum sections secured to edge trim and bonded to rear face of aluminum composite panel with silicone, and of sufficient size and strength to maintain flatness of the panel within the specified tolerances. Stiffeners shall have a mill finish.

B. Sealant Systems: Sealants and gaskets within the panel system shall be per manufacturer's standards. Sealant color shall be similar to the panel finish.

C. Reveals at Panel: Joints shall be 1/2 to 3/4 inch wide, nominal or as detailed on the drawings.

2.03 FLASHINGS

A. Fabrication flashing from 0.032 minimum thickness aluminum sheet; where exposed to view finish to match adjacent panels. Provide lap strip under flashing at abutted conditions; with lapped surfaces sealed with a full-bed of non-hardening sealant.

2.04 FABRICATION

A. Fabricate panel units to dimensions indicated on the drawings based on an assumed design temperature of 70 degrees F. Allow for ambient temperature range of time of fabrication and erection.

B. Fabricate panels in sizes shown using composite aluminum panel material and perimeter extrusion so that the panel thickness at the joinery is 1-1/2 inch. Completed panel shall be properly fabricated and designed so that no restraints can be placed on the panel which

might result in compressive skin stresses. The installation detailing shall be such that the installed panels shall remain flat due to temperature changes and at all times remain water and wind tight. Oil canning or oil pillowing of panel surface is not acceptable.

C. Where practical, shop fabricate units ready for erection. If not shop assembled, pre-fabricate components at the shop as required for proper and expeditious field assembly.

D. Design, fabricate, assemble and erect wall panel units, to be free of water leakage.

E. Provide stiffeners secure to rear face of panels mechanically retained to edge trim members, with spacing required by specific job wind loading.

2.05 SECONDARY FRAMING

A. Panel Supports and Anchorage: Provide girts, furring channels, angles, plates, bracing, and other secondary framing members.

1. Girts: C- or Z-shaped sections fabricated from 0.0598-inch- thick, shop-painted, roll-formed steel.
2. Flange and Sag Bracing: 1-5/8-by-1-5/8-inch angles, fabricated from 0.0598-inch-thick, shop-painted, roll-formed steel.
3. Base or Sill Angles: Fabricate from 0.079-inch- thick, cold-formed, galvanized steel sections.
4. Secondary structural members, except columns and beams, shall be manufacturer's standard sections fabricated from 0.079-inch- thick, cold-formed galvanized steel.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

A. Deliver fabricated units and component parts identified per erection Drawings.

B. Protection of Surfaces: Panels will have strippable peel coating. Protect surfaces from damage during shipping and erection. Inspect work for damage upon delivery - no damaged work permitted on jobsite.

C. Storage: Coordinate with General Contractor and storage space indicated on the phasing plans.

D. Panel Penetrations: Penetrations, other than those shown on the architectural drawings, required by other trades shall be done either by the trade involved or as an add to this contract with the trade involved bearing the cost.

3.02 INSPECTION

A. Examine supporting structure and conditions under which the work is to be erected, and notify the Contractor in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.03 INSTALLATION - ERECTION

A. Do not install component parts which are observed to be defective, including warped, bowed, dented, abraded and broken members.

B. Do not cut, trim, weld or braze component parts during erection, in a manner which would

damage finish, decrease strength, or result in a visual imperfection or a failure in performance of wall panels. Return component parts which require alteration to shop for refabrication, if possible, or for replacement by new parts.

C. Metal Separation; Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

D. Install structural support system provided under this section. Align properly to receive wall system. Support system to be installed to the same tolerance as required of the panel system.

E. Anchor component parts of the metal wall securely in place, providing for necessary thermal structural movement.

F. No exposed fasteners except as shown on architectural drawings.

3.04 CLEANING AND PROTECTION

A. After installation of panels on a given elevation, any additional protection shall be the responsibility of the General Contractor. Deposit all trash from panel shipping crates in General Contractor's furnished debris boxes. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants. Remove protective film at time of panel installation. Touch up minor scratches.

END OF SECTION

SECTION 07 62 00 SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Exposed trim
2. Metal flashing.
3. Reglets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07 72 33 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
2. Section 07 92 00 "Joint Sealants" for elastomeric sealants.
3. Section 13 34 19 “Metal Building Systems” for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.

1.05 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.01 METALS

A. Copper: ASTM B 370; temper H00, cold rolled except where temper 060 is required for forming; not less than 16 oz./sq. ft. (0.55 mm thick), unless otherwise indicated.

B. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.

C. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet, with a minimum thickness of 0.0625 inch (1.6 mm) except not less than 0.0937 inch (2.4 mm) thick for applications where burning (welding) is involved.

2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Burning Rod for Lead: Same composition as lead sheet.

B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

F. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

H. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

I. 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; noncorrosive; size and thickness required for performance.

J. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.03 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

F. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

G. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

H. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.04 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Exposed Trim: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

C. Base Flashing: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

D. Counterflashing: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

E. Flashing Receivers: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

F. Drip Edges: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

G. Equipment Support Flashing: Fabricate from the following material:
1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

H. Overhead-Piping Safety Pans: Fabricate from the following material:
1. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

2.05 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
   a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.
2. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   a. MM Systems Corporation.
   b. Petersen Aluminum Corporation.
   c. Vincent Metals.
   d. Or equal

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." 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 that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.

1. Do not solder the following metals: Coil-coated galvanized steel sheet.
2. Pretinning is not required for the following metals: Lead.
3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

E. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

I. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

J. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

K. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

3.03 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION

SECTION 07 65 00 FLEXIBLE FLASHING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Self-adhesive flashing used to seal around exterior windows, doors, and where required to weatherproof the building.

B. Waterproof membrane flashing used to seal around exterior door and window heads and sills, brick ledges, copings at masonry walls, common through-wall penetrations such as hose bibbs, vents, electrical boxes, exterior lights, and where required to waterproof the building.

1.02 RELATED SECTIONS

A. Section 07 26 00 – Vapor Retarders (for weather-resistive barrier).

1.03 SUBMITTALS: Submit manufacturer's technical product data, installation instructions and recommendations for product specified.

1.04 WARRANTIES

A. Provide Manufacturer's standard 10 year material and labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on product manufactured by Fortifiber Corporation, 300 Industrial Drive, Fernley, NV 89408. Tel. (800) 773-4777.

B. Equivalent products by the following manufacturers are acceptable:

1. Grace Construction Products, Cambridge, MA. Tel: (800) 444-6459.
2. Griffolyn ® Division, Reef Industries, Inc., Houston, TX. Tel: (800) 231-6074.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 SELF-ADHESIVE FLASHING

A. Membrane shall be a multi-layer composite employing polyethylene, fiberglass membrane and self-adhesive backing, meeting ASTM E-2112, equal to "Moistop E-Z Seal®" with the following characteristics:

1. Water Vapor Permeance: ASTM E-96 (Method A), ASTM F-1249, < 0.1 perms.
2. Water Resistance: ASTM D-779, 150 hours.
3. Tensile Strength: ASTM D-882, MD-30lb. f/inch, CD-35lb. f/inch.
4. Adhesion: PSTC-1, Plywood -5lbs./inch, Backing-6lbs./inch.
5. Mold Growth: ASTM G-21, 0 Fungal Growth.

2.03 WATERPROOF MEMBRANE FLASHING

A. Membrane shall be a self-sealing SBS modified asphalt waterproof membrane laminated to high density, cross-laminated polyethylene film reinforcement and self-adhesive backing, equal to “FortiFlash 40®” with the following characteristics:

1. Water Vapor Permeance: ASTM E-96, < 0.05 perms.
2. Water Resistance: ASTM D-779, >200 hours.
3. Puncture Resistance: ASTM E-154, 40 lbf.
4. Lap Adhesion: ASTM D-903, 10lb. f/inch.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure items that pass through membrane are properly and rigidly installed, substrate is free of projections and irregularities that may be detrimental to proper installation of membrane.

B. Prior to installation, window, door flanges, brick ledges and base materials shall be dry and cleaned free of any dirt or other substances that may interfere with adhesion.

3.02 INSTALLATION

A. The self-adhesive flashing shall first be applied at the sill of window openings. Moistop Sealant is then applied to the back of the window flanges and windows are installed. E-Z Seal flashing is next applied over the window flanges at jambs and then the head, completing the installation. Flashing around door openings is similar to window application. To apply, peel away the release paper and place E-Z Seal over the substrate or window and door flanges. Apply firm pressure along the entire adhesive strip to ensure a continuous seal.

B. To apply FortiFlash flashing, peel away the release paper and press membrane firmly over substrate, applying sufficient pressure along the entire membrane to ensure a continuous seal. If adhesion is inadequate, prime the surface with a polymer-emulsion-based primer designed specifically for SBS self-adhered membranes, in accordance with the manufacturer’s instructions.

3.03 CLEANING

A. Inspect membrane and substrate thoroughly and keep clean. Remove any dirt, oils, mud, debris, etc. prior to installation.

END OF SECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Firestopping as indicated on the drawings, specified herein, and/or required for completion of the work. Firestopping shall be required at all rated fire and smoke "fire barrier" walls and at floors.

1.02 SUBMITTALS

A. Submit manufacturer's product data, specifications and installation procedures for each type of firestopping and accessory required. Submit detailed location where each will be used. Submit UL data for assemblies where shown on the Drawings.

1.03 QUALITY ASSURANCE

A. Penetrations and miscellaneous openings in rated fire and smoke "fire barrier" walls shall be protected in accordance with NFPA 101, Life Safety Code, Chapter 6, Features of Fire Protection. All openings for air-handling ductwork or air movement, pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts and similar building service equipment that pass through or penetrate in any way a rated fire or smoke "fire barrier" wall or floor shall be protected. All firestopping materials used shall conform to ASTM E814, ASTM E119, and UL 1479 and tested in accordance with NFPA 90A and NFPA 251 as part of a rated assembly.

1.04 FIRE AND SMOKE PARTITIONS AND RELATED ASSEMBLIES

A. Based on Underwriters Laboratories (UL) systems and tests and are designed in accordance with UL fire resistance ratings. Contractor shall comply with the applicable UL requirements for fire and smoke partitions and assemblies shown on the drawings.

B. Materials not conforming to these firestopping specifications shall not be used. Materials that are not UL rated and approved shall not be allowed. Materials containing asbestos are not acceptable and shall not be used in this project.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver packaged materials in manufacturer's original unopened containers and store in weathertight enclosure. Handle and store all materials so as to prevent inclusion of foreign materials, breakage or damage by water.

1.04 WORKMANSHIP

A. Materials and workmanship not conforming to provisions of the Specifications and manufacturer's printed instructions shall be rejected at any time during the course of the work. Rejected materials shall be removed from the site at the time of rejection. Rejected workmanship shall be corrected immediately after rejection.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Hilti, Inc., Tulsa, OK. Tel. (800) 879-8000.
2. International Protective Coatings Corp., Hatfield, PA. Tel. (800) 334-8796.
3. 3M Fire Protection Products, Saint Paul, MN. Tel. (800) 328-1687.
4. United States Gypsum Company, Chicago, IL. Tel. (880) 874-4968.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 SEALANT

A. Equal to Hilti, Inc. FS-One.

2.03 CAULKING AND PUTTY

A. Equal to 3M Brand Fire Barrier CP- 25 Caulk and Putty 303.

2.04 PENETRATION SEALANTS

A. Equal to 3M Fire Barrier Penetration Sealing Systems 7902 and 7904 series as required.

2.05 INSULATION

A. Equal to United States Gypsum Company “Thermafiber” Safing Insulation, 4 pcf density, unfaced.

2.06 INTUMESCENT FIRESTOPPING

A. Equal to Hilti, Inc. FS-One, CP 642 and FS 657 Fire Block as required.

2.07 ACCESSORIES

A. Provide backing / filling materials, retainers, collars, clamps, sleeves, primers and other necessary items of types and duration required by regulatory requirements and / or as recommended by product manufacturer for the specific substrates, surfaces and applications.

2.08 FINISHES

A. Concealed locations: Manufacturer’s Standards.

B. Exposed to View Locations: “Custom” Colors as selected by Project Engineer / MDOT Architect unless Manufacturer’s Standards closely matches finish of penetrated surfaces.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of firestopping materials for small openings, cracks, crevices, and penetrations shall be in accordance with manufacturer's printed instructions.

B. Verify application required and location for each type of firestopping to be used and conform to manufacturer's exact instructions for specific applications.

C. After installation of all Work, including but not limited to ductwork, fire and smoke dampers, communication cabling, electrical conduit, etc., properly seal all openings, cracks, crevices and penetrations throughout the entire project, to maintain fire ratings shown.

D. Install fireproof sealant at all penetrations through rated walls and floors and at top and bottom on each side of rated walls.

E. Install approved metal sleeves with fireproof sealant at all communication and control wiring passing through rated walls throughout the entire project.

F. Install firestopping at fire and smoke walls and floors where construction passes through those areas.

END OF SECTION

SECTION 07 92 00 JOINT SEALANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation of substrate surfaces to receive materials.

B. Sealant and joint backing (backer rod) materials and installation in the following general locations (even though not shown on the Drawings):

1. Exterior and interior wall joints, including control / expansion joints and abutting like or similar materials (in walls, ceilings, and roof construction) that have spaces between in excess of 3/16 inch (except where less restrictive tolerances are indicated or where the condition is specifically the responsibility of others).
2. Abutting dissimilar materials, exterior and interior.
3. Exterior and interior wall openings (including at perimeter doors, exterior thresholds, windows, louvers, and penetrations required by piping, ducts, and other service and equipment, except for sealants provided by Section 07 84 00-Firestopping).
4. Joints in pavement and walks.
5. Other locations, not included above but, specifically required by manufacturers of installed materials / products (except that sealing materials for glazing are under provision of other Section.).

C. Accessories: Including, but not limited to, primer, cleaner, backer rod, bond breaker, and masking tape.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures and Section 09 05 15 – Color Design.

1.03 DEFINITIONS

A. Wherever the words "caulk" or "seal" occur, they shall be interpreted to mean "effectively seal the indicated joint with a material to render it air and watertight." "Caulk" shall indicate the use of the interior materials specified hereinafter and "Seal" shall indicate the use of the exterior materials.

1.04 WORK OF OTHER SECTIONS

A. Caulking and sealing may be performed as Work of other Sections when specified. However, all Work shall conform to the requirements of this Section.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of sealant required. Product data shall include chemical characteristics, limitations, and color availability.

1.06 QUALITY ASSURANCE

A. Applicator: Company specializing in the work of this Section with minimum 3 years documented satisfactory experience.

B. Manufacturer's Certificate: Provide manufacturer's letter of certification that products meet or exceed specified requirements and are appropriate for uses indicated.

C. Installation: Conform to Sealant and Waterproofers Institute requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver caulking and sealant material to the site in original unopened packages with manufacturer's labels, instructions and product identification and lot numbers intact and legible.

B. Store materials under cover, protected from inclement weather and adverse temperature extremes, in original containers or unopened packages, in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438. Tel: (800) 523-6688.

B. Equivalent products by the following manufacturers are acceptable:

1. Dow Corning Corporation, Midland, MI. Tel: (800) 322-8723
2. GE Silicones, Waterford, NY. Tel: (518) 233-2639.
3. Sonneborn Building Products, Shakopee, MN. Tel: (800) 433-9517.
4. Tremco, Inc., Beachwood, OH. Tel: (800) 562-2728.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 SEALANT TYPES AND USE SCHEDULE

A. Type 1: Use for interior locations, sealing around windows, doors, louvers, drywall and other locations to be painted and where joints are less than 1/8 inch with none to slight movement anticipated: Pecora AC-20 + Silicone (Acrylic Latex Caulking Compound).

B. Type 2: Use for sealing nonporous interior surfaces where conditions of high humidity and temperature extremes exist, including at and in conjunction with toilet fixtures, counters, vanities, thresholds and joints in tile finishes: Pecora 898 (Silicone Sanitary Sealant).

C. Type 3: Use for horizontal floor and pavement joints: Pecora Urexpan NR-200 (two-part, self-leveling, traffic-bearing, polyurethane sealant).

D. Type 4: Use for exterior sealing at door, louver, and window frames at masonry, and other materials: Pecora 890NST (one-part Architectural Silicone Sealant). Color(s) to be selected by the Project Engineer / MDOT Architect from manufacturer's full range of standard Architectural colors.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Backer Rod: Open cell polyurethane foam or closed cell polyethylene foam, compatible with sealant, sized and shaped to provide proper compression upon insertion in accordance with manufacturer's recommendations.

D. Bond Breaker: Pressure sensitive adhesive polyethylene, TEFLON, or polyurethane foam tape.

E. Masking Tape: Pressure sensitive adhesive paper tape.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer must examine areas and conditions under which this Work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION

A. Cleaning: Clean joint surfaces, using joint cleaner as necessary, to remove dust, dirt, oil, grease, rust, lacquers, laitance, release agents, moisture, frost or other matter that might adversely affect adhesion of sealant. Rake joints out to a depth equal to one-half the width.

B. Masking: Mask areas adjacent to joints.

C. Priming: If required, prime substrate surfaces following manufacturer's instructions.

D. Mixing: When required, mix components of sealant materials in accordance with manufacturer's instructions to achieve required characteristics of sealant.

3.03 APPLICATIONS

A. Mixing, application, surface condition, weather condition shall be as recommended by the manufacturer. Do not use material that has exceeded the recommended pot life.

B. Install backing material in joints using blunt instrument to avoid puncturing. Do not twist the backing rod while installing. Install backing rod so that joint depth is 50 percent of joint width, but a minimum of 1/8-inch deep and a maximum of 3/8-inch deep.

C. Apply sealant in joints using a pressure gun with nozzle cut to fit joint width. Ensure sealant is deposited in a uniform, continuous bead without gaps or air pockets.

D. Tool joints to the required configuration within 10 minutes of sealant application. Remove masking materials immediately after tooling.

3.04 CLEANING AND REPAIRING

A. Do not allow sealant or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means necessary to eliminate evidence of spillage.

B. When using flammable solvents, avoid heat, sparks and open flames. Provide necessary ventilation. Follow all precautions and safe handling recommendations from the solvent manufacturer and pertinent local, state and federal regulations.

C. Leave finished work in a neat, clean condition with no evidence of spillovers onto adjacent surfaces.

D. Repair or replace defaced or disfigured finishes.

3.04 CURE AND PROTECTION

A. Cure sealant and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

B. Sealant Supplier / Applicator shall advise 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 Completion.

END OF SECTION

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hollow metal Work, including but not limited to, the following:

1. Interior and exterior hollow metal doors and frames; rated and non-rated.
2. Trimmed openings.
3. Preparation of metal doors and bucks to receive finish hardware, including reinforcements, drilling and tapping necessary.
4. Preparation of hollow metal door to receive glazing (where required).
5. Factory prime painting of Work in this Section.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 08 14 00 - Wood Doors.

C. Section 08 71 00 - Door Hardware.

D. Section 08 80 00 - Glazing.

E. Section 09 05 15 - Color Design.

F. Section 09 90 00 - Painting and Coatings.

1.03 QUALITY ASSURANCE

A. In addition to complying with all pertinent codes and regulations, manufacture labeled doors in accordance with specifications and procedures of Underwriters' Laboratories, Inc. In guarantee and shop drawings, comply with nomenclature established in American National Standards Institute publication A123.1, latest edition, "Nomenclature for Steel Doors and Steel Door Frames".

B. Work is subject to applicable portions of the following standards:

1. ANSI A115 "Door and Frame Preparation for Door Locks and Flush Bolts", American National Standards Institute.
2. ANSI A123.1 "Nomenclature for Steel Doors and Steel Door Frames", American National Standards Institute.
3. NFPA 80 "Fire Doors and Windows", National Fire Protection Association.
4. NFPA 101 "Life Safety Code", National Fire Protection Association.

C. Hollow metal doors and frames shall comply with the specifications for Custom Hollow Metal Doors and Frames, National Assoc. of Architectural Metal Manufacturers (NAAMM) Standard CHM 1-74, and the Steel Door Institute, SDI 100-80.

1.04 SUBMITTALS

A. Product Data: Submit schedule and manufacturer's technical product data / literature.

B. Shop Drawings: Shop drawings shall indicate door and frame elevations, frame configuration, anchor types and spacing, reinforcement, location of cut-outs for hardware, glazing and louvers (if required).

C. Samples (not required for named products):

1. Submit hollow metal frame, corner section of typical frame, of sufficient size to show corner joint, hinge reinforcement, dust cover boxes, anchors, and floor anchors.
2. Submit hollow metal door section of typical door, of sufficient size to show edge, top and bottom construction, insulation, hinge reinforcement, face stiffening, corner of vision opening construction, glazing beads, corner of louver opening construction (if required).

1.05 PRODUCT IDENTIFICATION

A. Deliver doors and frames and other work of this section properly tagged and identified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle all metal doors and frames in a manner to prevent damage and deterioration.

B. Provide packaging, separators, banding, spreaders, and individual wrappings as required to completely protect all metal doors and frames during transportation and storage.

C. Store doors upright, in a protected dry area, at least 4 inches off the ground and with at least 1/4 inch air space between individual pieces, protect all pre-finished and hardware surfaces.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Steelcraft Manufacturing Company, 9017 Blue Ash Road, Cincinnati, OH 45242 Tel. (513) 745-6400.

B. Equivalent products by the following manufacturers are acceptable:

1. Amweld Building Products, Inc., Garrettsville, OH. Tel. (330) 527-4385.
2. Ceco Door Products, Brentwood, TN. Tel. (615) 661-5030.
3. Republic Builders Products, McKenzie, TN. Tel. (901) 352-3383.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 FABRICATION

A. Fabricate hollow metal units rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable. Unless otherwise indicated, provide countersunk flat Philips or Jackson heads for exposed screws and bolts.

B. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping per final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware".

C. Locate finish hardware in accordance with approved shop drawings.

2.03 FRAMES

A. Frames for exterior openings shall be made of commercial grade 14 gage minimum cold rolled steel conforming to ASTM A366-68 with a zinc coating conforming to ASTM A653, with a coating designation of A60 or G60 and a minimum coating thickness of 0.60 oz. per sq. ft. minimum. Frames for interior openings shall be commercial grade cold rolled steel conforming to ASTM A366-68 or commercial grade hot rolled and pickled steel conforming to ASTM A569-66T. Metal thickness shall be 16 gage for frames in openings 4 feet or less in width; 14 gage for frames in openings over 4 feet in width.

B. Design and Construction: Frames shall be custom made welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knocked-down frames will not be accepted. Finished work shall be strong, rigid, and neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths. Jamb depths, trim, profile and backbends shall be as shown on Drawings. Corner joints shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops mitered. The use of gussets will not be permitted.

1. Stops shall be 5/8 inch deep. Cut-off (sanitary or hospital type) stops, where scheduled, shall be capped at 45 degrees at heights shown on drawings, and all jamb joints below cut-off stops shall be ground and filed smooth, making them imperceptible. Do not cut off stops on frames for soundproof, lightproof on lead-lined doors.

2. When shipping limitations so dictate, frames for large openings shall be designed and fabricated for field splicing by others.
3. Frames for multiple or special openings shall have mullion and / or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.
4. Hardware reinforcements: Frames shall be mortised, reinforced, drilled and tapped at the factory for fully templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates. Frames shall be reinforced for closers. Minimum thickness of hardware reinforcing plates shall be as follows:
   a. Hinge and pivot reinforcements - 7 gage, 1 1/4 inches by 10 inches minimum.
   b. Strike reinforcements - 12 gage.
   c. Flush bolt reinforcements - 12 gage.
   d. Closer reinforcements - 12 gage.
   e. Reinforcements for surface-mounted hardware - 12 gage.

5. Floor anchors: Floor anchors shall be securely welded inside jambs for floor anchorage. Where required, provide adjustable floor anchors, providing not less than 2 inches height adjustment. Floor anchors shall be 14-gage minimum.

C. Finish: After fabrication, tool marks and surface imperfections shall be removed, and exposed faces of welded joints shall be dressed smooth. Frames shall be chemically treated to insure maximum paint adhesion and coated on accessible surfaces with rust-inhibitive primer complying with FS-TT-P-57 (Type II) or FS-TT-P-659 with 2.0 mils minimum thickness. Fully cure before shipment.

2.04 HOLLOW METAL DOORS

A. Doors shall be made of commercially quality, level, cold rolled steel conforming to ASTM A366-68 and free of scale, pitting or other surface defects. Face sheets for interior doors shall be18 gage minimum. Face sheets for exterior doors shall be 16-gage minimum with zinc coating conforming to ASTM A653, with a coating designation of A60 or G60 and a minimum coating thickness of 0.60 oz. per sq. ft. minimum.

B. Design and Construction: Doors shall be custom made, of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Door thickness shall be 13/4 inches unless otherwise noted. Doors shall be strong, rigid and neat in appearance, free from warp or buckle. Corner bends shall be true, straight and of minimum radius for the gage of metal used.

C. Stiffen face sheets with continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be 22 gage minimum, spaced 6 inches apart and securely attached to face sheets by spot welds 5 inches on center. Spaces between stiffeners shall be sound-

deadened insulated full height of door with an inorganic non-combustible batt-type material.

D. Join door faces at their vertical edges by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

E. Top and bottom edges of doors shall be closed with a continuous recessed 16 gage minimum steel channel, extending the full width of the door and spot welded to both faces. Exterior doors shall have additional flush closing channel at top edges and, where required for attachment of weather-stripping, a flush closure at bottom edges. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.

F. Edge profiles shall be provided on both vertical edges of doors as follows:

1. Single-acting swing doors - beveled 1/8 inch in 2 inches.
2. Double-acting swing doors - rounded on 2-1/8 inch radius.

F. Hardware reinforcements: Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closures, etc.) is to be applied, doors shall have reinforcing plates. Minimum gages for hardware reinforcing plates shall be as follows:

1. Hinge and pivot reinforcement - 7 gage.
2. Reinforcement for lock face, flush bolts, concealed holders, concealed or surface-mounted closers - 12 gage.
3. Reinforcements for all other surface mounted hardware - 16 gage.

G. Glass moldings and stops:

1. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others per glass opening sizes shown on Drawings. Fixed moldings shall be securely welded to door on security side.
2. Loose stops shall be 20-gage steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced 8 inches on center. Snap-On attachments will not be permitted. Stops shall be flush with face of door.

H. Finish: After fabrication, tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall be chemically treated to ensure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive primer. Fully cure before shipment.

I. Flatness: Doors shall maintain a flatness tolerance of 1/16 inch maximum in any direction, including a diagonal direction.

2.05 HOLLOW METAL PANELS

A. Hollow metal panels shall be made of the same materials and constructed and finished in the same way as specified for hollow metal doors.

2.06 LABELED DOORS & FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings, and as scheduled on Drawings. Such doors and frames shall be Underwriters' Laboratories, Inc. labeled or other nationally recognized agency having a factory inspection service.

B. When door or frame specified to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Project Engineer / Architect shall be advised before fabricating work on that item is started.

2.07 HARDWARE LOCATIONS

A. Hinges:

1. Top – 5 inches from head of frame to top of hinge.
2. Bottom – 10 inches plus 1 inch from finished floor to bottom of hinge.
3. Intermediate, centered between top and bottom hinges.
4. on Dutch doors:
   a. 5 inches from head of frame to top of hinge.
   b. 10 inches from finished floor to bottom of bottom hinge.
   c. 5 inches from split line to top and bottom respectively of lower and upper intermediate hinges.

5. All lead-lined doors or doors over 7’-0” tall shall receive two pair of hinges per leaf or continuous hinges.

B. Unit and integral type locks and latches – 3’- 2” to centerline of knob.

C. Deadlocks – 5’- 0” to centerline of cross bar.

D. Panic hardware – 3’-1” to centerline of cross bar.

E. Door pulls – 3’-6” to center of grip.

G. Push-pull bars – 3’-1” to centerline of bar.

H. Arm pulls – 3’-11” to centerline.

I. Push plates – 4’- 0” to centerline of plate.

J. Roller latches – 3’-9” to centerline.

K. All of the above dimensions from paragraph 2.07(B) through 2.07(J) are from finished floor.

2.08 CLEARANCES

A. Edge clearances:

1. Between doors and frame, at head and jambs - 1/8 inch.
2. At door sills: where no threshold is used - 1/4 inch maximum above finished floor; where threshold is used - 3/4 inch maximum above finished floor.
3. Between meeting edges of pairs of doors - 1/8 inch.

B. Finished floor is defined as top surface of floor, except when resilient tile or carpet is used, when it is top of concrete slab. Where carpet is more than 1/2 inch thick, allow 1/4 inch clearance.

2.09 PREPARATION FOR FINISH HARDWARE

A. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to ensure correct fitting and installation. Include preparation for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware. Drill and tap mortise reinforcements at factory, using templates. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed. Replace rejected materials.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions where hollow metal Work is to be installed and notify Project Engineer of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install hollow metal units and accessories in accordance with approved Shop Drawings, manufacturer's data, and Specifications.

B. Provide masonry anchorage devices where required for securing hollow metal frames to in-place concrete or masonry construction. Set anchorage devices opposite each anchor location, in accordance with details on final shop drawings and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed, and free from dust and debris.

C. Placing frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. At wood stud partitions, attach wall anchors to studs with tapping screws. Place frames at fire-rated openings in accordance with NFPA Standard No. 80.
2. Make field splices in frames as detailed on final Shop Drawings, welded and finished to match factory work.
3. Remove spreader bars only after frames or bucks have been properly set and secured.
4. Door installation: Fit hollow metal doors accurately in their respective frames, with the following clearances:
   a. Jambs and head: 3/32 inch.
   b. Meeting edges, pairs of doors: 1/8 inch.
   c. Bottom: 1/4 inch, where no threshold or carpet.
   d. Bottom: at threshold or carpet: 1/8 inch.
   e. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

END OF SECTION

SECTION 08 14 29 PREFINISHED WOOD DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent and location of each type of wood door is shown on the Drawings and in Schedules. Types of doors required include solid core flush wood doors with veneer faces. Louvers for wood doors, including furnishing and installation, are specified under this Section.

1.02 RELATED SECTIONS

A. Section 08 80 00 – Glazing.

B. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Product Data: Indicate door core material and construction; veneer species, type and characteristics.

B. Shop drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, identify cutouts for glazing and louvers, and installation instructions. Indicate by transmittal form that copy of each instruction has been transmitted to the installer

1.04 QUALITY ASSURANCE

A. Comply with the requirements of the following standards unless otherwise indicated.

B. Non-Fire Rated Wood Doors: WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Where fire-resistance classifications are shown or scheduled for wood door assemblies, provide doors which comply with requirements of NFPA No. 80 "Standard for Fire Doors and Windows" and which have been tested and rated with single point hardware by UL. Provide UL Label on each door and panel.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the on-site care recommendations of AWI “Care & Instruction at Job Site” Section 1300, G-22.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Graham Manufacturing Corp., P.O. Box 1647, Mason City, IA. Tel. (641) 423-2444.

B. Equivalent products by the following manufacturers are acceptable:

1. Algoma Hardwoods, Inc., Algoma, WI. Tel. (800) 678-8910.
2. Marshfield Door Systems, Inc., Marshfield, WI. Tel. (800) 869-3667.
3. TruStile Doors, LLC, Denver, CO. Tel. (888) 286-3931.
4. VT Industries, Inc., Holstein, IA. Tel. (800) 827-1615.

C. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 62 14-Product Options and Substitution Procedures.

2.02 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:
   a. 5-inch top-rail blocking, in doors indicated to have closers.
   b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
3. Provide doors with either glued-wood-stave or better than stave cores instead of particleboard cores for doors indicated to receive exit devices.

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals Comply with specified requirements for exposed edges.

E. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
   a. 5-inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 5-inch midrail blocking, in doors indicated to have armor plates.
   d. 4-1/2 by 10 inch lock blocks in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.03 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors.

1. Grade: Premium, with Grade A faces.
2. Species: SELECT White Birch.
3. Cut: Plain sliced (flat sliced).
4. Doors with sharp contrast of shades and/or barber poling SHALL NOT be permitted and will be REJECTED. Provide exposed edges and other exposed solid wood components of same species as face veneers.
5. Match between Veneer Leaves: Slip match.
6. Assembly of Veneer Leaves on Door Faces: Center-balance match.
7. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
8. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
9. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
10. Transom Match: Continuous match.
11. Exposed Vertical Edges: Same species as faces or a compatible species.
12. Core-Non-rated: Particleboard.
13. Core-Fire-rated: Mineral.
14. Construction: Five plies (PC-5). Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

B. Light Openings: Factory cut openings. Trim openings for non-fire rated doors with solid wood moldings of manufacturer’s standard shape, unless indicated otherwise. Same species as door faces.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.04 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated. Comply with requirements in NFPA 80 for fire-rated doors.

B. 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.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber**,** rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings:

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.05 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing. Finish faces, all four edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Gloss

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine doorframes and verify that frames are correct type and have been installed for proper hanging of corresponding doors. Installer shall notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors; do not proceed with installation until unsatisfactory conditions have been corrected. Install fire-rated doors in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80.

3.02 PREPARATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

3.03 INSTALLATION

A. Install wood doors in accordance with manufacturer's instructions and approved Shop Drawings. Fit doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining. Bevel non-fire rated doors 1/8 inch in 2 inches at lock and hinge edges. Bevel fire rated doors 1/16 inch in 2 inches at lock edge.

B. Door Clearances: Fit to frames and machine for hardware for proper fit and uniform clearance at each edge.

1. For non-fire rated doors, provide following clearances:

a. 1/8 inch at jambs and heads.
b. 1/8 inch at meeting stiles for pairs of doors.
c. 1/2 inch from bottom of door to top of decorative floor finish or covering, except where threshold is shown or scheduled provide 1/4 inch clearance from bottom of door to top of threshold.

2. For fire-rated doors, provide clearances complying with limitations of authority having jurisdiction.

3.04 ADJUSTING AND CLEANING

A. Re-hang or replace doors that do not swing or operate freely. Refinish or replace doors damaged during installation.

3.05 PROTECTION OF COMPLETED WORK

A. Installer shall advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of the Work.

B. Doors damaged before acceptance of the Work shall be repaired or replaced.

END OF SECTION

SECTION 08 33 23 OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: The extent of overhead coiling doors is shown on the Drawings. Provide complete operating door assemblies including door curtains, guides, and counterbalance mechanism, hardware, operators and installation accessories

B. Related Sections:

1. Division 05 Sections: Miscellaneous Metals for steel supports.
2. Division 09 Section -09 05 15 - Color Design
3. Division 26 Sections: Electrical connections and service for powered door operators.

1.02 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials: ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design and reinforce overhead coiling doors to withstand a 20 PSF (87 MPH) wind loading pressure in the fully closed position unless otherwise indicated.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s product data and installation instructions.

B. Shop Drawings: Provide drawings indicating guide details, head and jamb conditions, clearances, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.

C. Quality Assurance Submittals:

1. Certificates: Submit manufacturer’s certificate that products meet or exceed specified requirements.
2. Certificates: Submit installer qualifications.

D. Closeout Submittals: Submit Warranty documents.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door dealer to perform the work of this Section.

B. Regulatory Requirements and Approvals: Comply with IBC 2009 and AHJ requirements.

C. Preinstallation Meetings: Verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 01 Project Management and Coordination (Project Meetings) Section.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 01 Product Requirements.

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.07 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1.08 MAINTENANCE

A. Maintenance Service: Submit for Owner's consideration and acceptance maintenance service agreement for products installed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Raynor Garage Doors, P.O. Box 448, Dixon, IL 61021. Tel. (800) 472-9667.

B. Equivalent products by the following manufacturers are acceptable:

1. Overhead Door Corp., Dallas, TX. Tel. (800) 887-3667.
2. Windsor Door, Little Rock, AR. Tel. (800) 946-3767.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 COILING DOOR

A. Steel door assembly shall be provided as one complete unit including, but not limited to, sections, brackets, tracks, counterbalance mechanisms and hardware. Equal to DURACOIL STANDARD by Raynor Garage Doors.

2.03 DOOR OPERATORS

A. Provide doors designed for electric motor operation.

B. Manufacturer Product Designation: Raynor PowerHoist Standard (Model Series PHS).

1. Type: Jackshaft with manual chain hoist.
2. Motor Horsepower Rating: Continuous Duty-sized by manufacturer's recommendation.
3. Electrical Requirements: 115 volt single phase.
4. Duty Cycle: 30 cycles/hour.
5. Control Wiring: Contractor Style Motor starter 24 volt control with provisions for connection of safety edge to reverse and external radio control hook-up. Three button momentary contact "open-close-stop" Solid State motor controller 24 volt control with provisions to select up to 6 standard wiring types plus delay on reverse, mid stop, maximum run timer, and door lock feature.

2.04 CURTAIN

A. Material: Interlocking steel slats, 22 gage (0.030 inch minimum thickness) roll-formed from commercial quality hot-dipped galvanized (G-90) steel in compliance with ASTM A-653.

1. Slat Type: Flat Slat.
   a. Insulation: Polyisocyanurate with R-value 6.24 and U-value 0.160.
   b. Back Covers: Galvanized steel, 24 gage (0.023 inch) minimum thickness.

B. Mounting: Face Mounting: fasten to face of wall on each side of door opening

C. Color and Finish: One finish coat of ArmorBrite™ Powdercoat applied over one coat of white epoxy primer. Color as selected by MDOT Architect from manufacturer's full selection of standard colors.

D. Endlocks: Lateral movement of the slats to be contained by means of zinc-plated malleable endlocks fastened with two zinc-plated steel rivets.

E. Bottom Bar and Seal: Two roll-formed galvanized steel angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch with single-contact type bottom astragal. Structural angle bottom bar to receive one coat of rust-inhibitive primer.

F. Curtain Wear Straps: Polyester.

2.05 GUIDES

A. Guide Assemblies: To consist of three structural steel angles, minimum 3 inches by 2 inches by 3/16 inch and fitted with removable curtain stops. Steel guides to be provided with one coat of rust-inhibitive primer.

B. Jamb Construction: Steel Jambs with self-tapping fasteners.

C. Weather Seal: Snap-on vinyl seal.

2.06 COUNTERBALANCE SYSTEM

A. Headplates: 3/16 inch steel plate, attached to wall angle of guide assembly with 1/2 inch diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing. Provide head plates with one coat of rust-inhibitive primer

B. Barrel: Minimum 4-1/2 inches O.D. and 0.120 inch wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch per foot of span.

C. Counterbalance: Provide torsion counterbalance mechanism as follows: Torsion Spring: Oil-tempered, helical torsion springs, grease packed and mounted on a continuous steel torsion shaft.

2.07 ENCLOSURES

A. Round Hood: 24 gauge steel, finish-painted to match curtain.

B. Hood Baffle: With EPDM rubber seal to inhibit air infiltration through hood cavity.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions and recommendations of door manufacturer.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings square, flush and plumb.

B. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

3.03 INSTALLATION

A. General: Install door, guide and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.

B. Instruct Owners personnel in proper operating procedures and maintenance.

3.04 ADJUSTING

A. General: Lubricate bearings and sliding parts and adjust doors for proper operation, balance, clearance and similar requirements.

3.05 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

B. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

END OF SECTION

SECTION 08 41 13 ALUMINUM-FRAMED ENTRANCES & STOREFRONTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed entrance and storefront system includes tubular aluminum sections with supplementary internal support framing as required, aluminum and glass entrances, shop fabricated, factory finished, glass and glazing, related flashing, anchorage and attachment devices.

1.02 RELATED SECTIONS

A. Section 08 71 00 - Door Hardware: Mortised hardware reinforcement requirements affecting framing members; hardware items other than specified in this section.

B. Section 08 80 00 - Glazing.

C. Section 09 05 15 - Color Design.

D. Section 12 21 31 - Horizontal Louver Blinds: Attachments to framing member.

E. Division 26 and 27 Electrical Section(s) for electronic hardware.

1.03 SUBMITTALS

A. Product Data: Submit component dimensions; describe components within assembly, anchorage, fasteners, and glass.

B. Shop Drawings: Submit Shop Drawings for fabrication and installation, including elevations, detail sections, anchorage, reinforcement, and glazing.

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

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA - Metal Curtain Wall, Window, storefront and Entrance Guide Specifications Manual.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing aluminum glazing systems with minimum five years experience.

B. Design structural support framing components under direct supervision of a professional engineer experienced in design of this Work and licensed at the place where the Project is located.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store, protect, and handle products to and on project site per manufacturer’s instructions.

B. Store products on minimum 4-inch high wood blocking and cover. Do not use non-vented plastic or canvas that could create a humidity chamber.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealant or glazing materials when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.08 COORDINATION

A. Section 01 31 00 – Project Management & Coordination: Administrative requirements for coordination and project conditions.

B. Coordinate Work with Section 08 71 00 Door Hardware.

1.09 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Execution Requirements for Product warranties and bonds.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Kawneer Co., Inc., 555 Guthridge Court, Norcross, GA 30092. Tel. (770) 449-5555.

B. Equivalent products by the following manufacturers are acceptable:

1. Traco, Cranberry Township, PA. Tel. (724) 776-7000.
2. Vistawall Architectural Products, Terrell, TX. Tel. (972) 551-6100.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 MATERIALS

A. Storefront Framing: Kawneer Trifab VG 451 - 2 inches by 4-1/2 inches and 4-1/2 inches by 4 -1/2 inches nominal dimensions; Screw Spline Fabrication.

B. Aluminum Entrances: Kawneer Series 350 Medium Style Swing Doors. Coordinate door hardware with Division 26 and 27 Sections. Access control system and electric strikes to be provided by Electrical.

C. Accessories:

1. Weatherstripping: Sealair weathering comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
2. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. Finish shall be painted to match door color.
3. Threshold: Extruded aluminum with anodized finish, one piece per door opening, with ribbed surface.
4. Offset Pivots: Top and bottom. Finish shall be No.17 Clear anodized.

5. Push / Pull: Architects Classic Hardware Style “CO-9” pull and “CP-11” push bar. Mount pull top attachment 44-3/16 inches above bottom of door and push bar 37 inches above bottom of door. Finish shall be No.14 Clear anodized aluminum.
6. Closers: LCN Quest.
7. Locks: Adams-Rite MS 1850A (Refer to Section 08 71 00 for cylinder) mount 41-9/16 inches above bottom of door.
8. Electronic Hardware: See Division 26 and 27 Electrical Sections.

2.03 COMPONENTS

A. Extruded Aluminum: ASTM B221; 6063 alloy for extruded structural members.

B. Glass and Glazing Materials: As specified in Section 08 80 00.

C. Flashing: Minimum 0.032-inch thick aluminum.

D. Sealant and Backing Materials:

1. Sealant used within system (Not Used for Glazing): Manufacturer’s standard materials to achieve weather, moisture, and air infiltration requirements.
2. Perimeter Sealant: Specified in Section 07 92 00.

2.04 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Reinforce interior horizontal head rail to receive blind track brackets and attachments.

F. Prepare components with internal reinforcement for door hardware.

G. Reinforce framing members for imposed loads.

2.05 ALUMINUM FINISHES

A. Clear Anodized Finish:

a. Class II, Clear Anodized Finish, AA-M12C22A31 (mechanical finish, non-specular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA607.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 31 00 - Administrative Requirements: Coordination and project conditions.

B. Verify dimensions, tolerances, and method of attachment with other Work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.

3.02 INSTALLATION

A. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

B. Provide alignment attachments and shims to permanently fasten system to building structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent Work

D. Provide thermal isolation where components penetrate or disrupt building insulation.

E. Install sill flashing. Turn up ends and edges; seal to adjacent Work to form water tight dam.

F. Coordinate attachment and seal of perimeter air and vapor barrier materials.

G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Install integral flashing and integral joint sealers.

I. Set thresholds in bed of mastic and secure.

J. Install hardware using templates provided. Refer to Section 08 71 00 for installation requirements.

K. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.

L. Coordinate installation of perimeter sealants with Section 07 92 00.

3.03 CLEANING

A. Section 01 74 00 –Cleaning and Waste Management: Final cleaning.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 61 15 - Basic Product Requirements: Protecting installed construction.

B. Protect finished Work from damage.

END OF SECTION

SECTION 08 71 00 DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hardware as shown on the Drawings and in Schedules. Door hardware is hereby defined to include all items known commercially as builders hardware, as required for swing doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. The required types of hardware include (but are not limited to) the following:

1. Butts and hinges
2. Lock cylinders and keys
3. Lock and latch sets
4. Bolts
5. Panic exit devices
6. Push/pull units
7. Closers
8. Door trim units
9. Stripping and seals
10. Thresholds

B. Items of hardware not definitely specified, but required for the completion and proper operation of the doors, shall be suitable in type, comparable to the type specified for similar openings. Labeled doors shall be fitted with labeled hardware.

C. All modifications of hardware required by reason of construction characteristics shall be such as to provide the proper operation or functional features. Contractor shall be fully responsible for checking all details, such as wall trim clearance, bevels, backsets, proper type strike plates, length of spindles, hands of locks, etc., in order that all items of hardware shall fit properly. Hardware for application to metal shall be made to standard templates. Template information shall be furnished to door and frame fabricators and all other trades requiring same, in order that they may cut, reinforce or otherwise prepare in the shop, materials for reception of hardware.

D. Hardware shall be free from defects affecting appearance and serviceability. Working parts shall be well fitted and smooth working without unnecessary play. All items of hardware shall be delivered to the building site in sufficient time in advance of its requirement for use for inspection prior to installation.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and Installation instructions for each type of hardware. Include operating instructions, maintenance information and spare part sources.

B. Contractor's Hardware Schedule: After all samples have been approved but prior to delivery of hardware, Contractor shall prepare and submit to the Project Engineer / MDOT Architect a complete schedule of all finish hardware required. Schedule shall follow requirements of Specifications and shall indicate type, manufacturer's name and number, location and finish of each item required. Approval of schedule will not relieve Contractor of responsibility for furnishing all necessary hardware.

C. Submit such samples as required by the Project Engineer / MDOT Architect for approval. Do not deliver hardware until approval is obtained.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:

1. ANSI A117.1 – Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
2. NFPA 101.

B. Hardware Supplier: Company specializing in supplying commercial door hardware with five years documented experience and approved by manufacturer.

C. Hardware supplier shall have in his employment, an Architectural Hardware Consultant (AHC) in good standing as certified by the Society of Hardware Consultants Council. The Architectural Hardware Consultant shall assist the Contractor in installation and verify that hardware has been furnished and installed in accordance with manufacturer's instructions and as specified herein.

D. Templates: The hardware supplier shall provide templates and / or physical hardware to trades as required and in sufficient time to prevent delay in the execution of the Work.

1.04 PACKING AND MARKING

A. Package each item of hardware and lockset separately in individual containers, complete with screws, keys, instructions and installation template for spotting mortising tools. Mark each container with item number corresponding to number shown on Contractor's hardware schedule.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Best Access Sys. Indianapolis, IN. Tel: (800) 311-1705.
2. Corbin Russwin Arch't. Hardware. Berlin, CT. Tel: (800) 543-3658.
3. Dorma Door Controls, Inc. Reamstown, PA. Tel: (800) 523-8483.
4. Hager Companies. Saint Louis, MO. Tel: (800) 325-9995.
5. LCN. Princeton, IL. Tel: (800) 526-2400.
6. McKinney Hinge. Scranton, PA. Tel: (800) 346-7707.
7. Pemko. Ventura, CA. Tel: (800) 283-9988.
8. Rockwood Manufacturing Co. Rockwood, PA. Tel: (800) 458-2424.
9. Schlage Lock Co. Colorado Springs, CO. Tel: (800) 847-1864.
10. Stanley Hardware. New Britain, CT. Tel: (800) 337-4393.
11. Trimco/BBW/Quality. Los Angeles, CA. Tel: (323) 262-4191.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 KEYING / CYLINDERS

A. All cylinders and locksets shall be set to the existing masterkey system. Furnish all cylinders & locksets with removable type cores. The removable core system shall be one that uses either temporary construction cores or construction keyed cores operated by a

construction key until such time the construction key is rendered inactive by the change key or retractor key.

B. All cylinders shall be keyed in sets as directed by the Project Engineer / MDOT Architect. Furnish 3 change keys per lock and 6 masterkeys per set.

2.03 MATERIALS

A. See Hardware Schedule at end of this Section. Products listed set standard.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights recommended in "Recommended Locations for Builders' Hardware" NBHA, except as other wise specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Project Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

D. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hairline joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

E. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel that will not corrode in contact with the threshold metal.

1. At exterior doors, and elsewhere as indicated, set thresholds in a bed of either butyl rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source.
2. Do not plug drainage holes or block weeps. Remove excess sealant.

3.02 ADJUSTING AND CLEANING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

3.03 SCHEDULE:

HW1 (For Storefront Exterior Doors)
Each Opening Shall Have:

1 – Pair Cylinders	Best	1E72/1E74 As Required

(Balance of Hardware by Door Manufacturer)

HW2 (For Exterior Hollow Metal Doors)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x NRP X 652
1 – Lockset	Schlage	ND50PD Rhodes x US26D
1 – Closer	LCN	P1460/1460 AL x TBGN
1 – Kickplate	Rockwood	8 x 2 LDW 0.050 x US32D (mounted push side)
1 – Threshold	Pemko	2005AV
1 – W/Strip	Pemko	303AV
1 – Door Bottom	Pemko	2211AV (for Hollow Metal Doors)
1 – Stop		(As Required)
3 – Silencers		

HW3 (For Interior Wood Doors @ Offices)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x 652
1 – Lockset	Schlage	ND50PD Rhodes x US26D
1 – Closer	LCN	1460 AL x TBGN @ Rated Walls & as indicated
1 – Kickplate	Rockwood	8xX 2 LDW 0.050 x US32D (mounted push side)
1 – Mop Plate	Rockwood	6 x 1 LDW 0.050 x US32D (mounted pull side)
1 – Stop	Rockwood	440 x US26D
3 – Silencers		

HW4 (For Interior Wood Doors @ single Toilet Room)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x 652
1 – Lockset	Falcon	D271 x US26D
1 – Privacy	Schlage	D40S Rhodes x US26D
1 – Closer	LCN	1460 AL x TBGN
1 – Kickplate	Rockwood	8 x 2 LDW 0.050 x US32D (mounted push side)
1 – Mop Plate	Rockwood	6 x 1 LDW 0.050 x US32D (mounted pull side)
1 – Stop	Rockwood	440 x US26D
3 – Silencers		

HW5 (Work Area)
Each Opening Shall Have:

3 – Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x 652
1 – Passage	Schlage	ND10S Rhodes x US26D
1 – Closer	LCN	1460 AL x TBGN @ Rated Walls & as indicated
1 – Kickplate	Rockwood	8 x 2 LDW 0.050 x US32D (mounted push side)
1 – Mop Plate	Rockwood	6 x 1 LDW 0.050 x US32D (mounted pull side)
1 – Stop	Rockwood	440 x US26D
3 – Silencers		

HW6 (For Interior HM @ Electrical, Mechanical & Storage Rooms)
Each Opening Shall Have:

6 – Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x 652
1 – Lockset	Schlage	ND50RD Rhodes x US26D
1 – Cylinder	Best	As Required
2 – Flushbolts	Rockwood	555-12” x US26D
1 – Stop	Rockwood	440 x US26D (Overhead Stop as Required)
2 – Silencers		

HW7 (Interior Wood Doors @ Multi-Use Restrooms)
Each Opening Shall Have:

3	Each Hinges	Hager	BB1279 4 1/2 x 4 1/2 x 652
-	Passage	Schlage	ND10S Rhodes x US26D
1	Closer	LCN	1460 x TBGN
-	Kickplate	Rockwood	8 x 2 LDW 0.050 x 630 (Mounted push side)
1	Mop Plate	Rockwood	6 x 1 LDW 0.050 x 630 (Mounted push side)
-	Stop	Rockwood	440 x US26D
1	Silencers		
-			
1			
-			
1			
-			
3			
-			

END OF SECTION

SECTION 08 80 00 GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for doors, windows and other glazed openings, interior and exterior locations.

1.02 RELATED SECTIONS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 14 29 - Prefinished Wood Doors.

C. Section 08 41 13 - Aluminum Framed Entrances and Storefronts.

D. Section 08 92 00 - Glazed Aluminum Curtainwall.

1.03 QUALITY ASSURANCE

A. Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Prime Glass Standard: FS DD-G-45l.

C. Heat-Treated Glass Standard: FS DD-G-l403.

D. Safety Glass Standard: CPSC l6 CFR l20l.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect glass during transit, storage and handling to prevent scratching or breakage of glass. Replace all broken glass.

1.05 PROJECT CONDITIONS

A. Meet with Glazier and other trades affected by glass installation, prior to beginning of installation. Do not perform work under adverse weather or job conditions. Install liquid sealant when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.06 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch-(300-mm-) square Samples for glass.

1. Each color of tinted float glass.
2. Each type of patterned or spandrel glass.
3. Insulating glass for each designation indicated.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying the products furnished comply with requirements.

D. Qualifications 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. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

F. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Tined float glass.
2. Coated float glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing gaskets.

G. Warranties: Special warranties specified in this Section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following prime glass manufacturers are acceptable:

1. Zeledyne, Tulsa, OK. Tel. (800) 331-2607.
2. AFGD Glass, Inc., Atlanta, GA. Tel. (800) 766-2343.
3. Guardian Industries Corp., Carleton, MI. Tel. (800) 521-9040.
4. Pilkington North America, Toledo, OH. Tel. (419) 247-3731.
5. PPG Industries, Inc., Pittsburgh, PA. Tel. (800) 377-5267.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures

2.02 INSULATING GLASS

A. Material: Shall consist of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated. Unless shown otherwise on Drawings, use this type glass for all exterior applications.

B. Characteristics: Other requirements specified for glass characteristics, air space, sealing system, sealant spacer material, corner design and desiccant are as follows:

1. Thickness of Each Pane: 1/4 - inch.
2. Airspace Thickness: 1/2 - inch.
3. Sealing System: Manufacturer’s standard 1 inch sealing system.
4. Spacer Material: Manufacturer's standard metal-white.
5. Desiccant: Manufacturer's standard, either molecular sieve or silica gel.
6. Corner Construction: Manufacturer's standard.
7. Exterior Pane: Tinted; color – equal to “Super Neutral 68 (#2) on Green” by Sun Guard.
8. Interior Pane: Clear with MSVD (Sputter) Low-E on 3rd (air space) surface.
9. Unit Performance Requirements for “Super Neutral 68 (#2) on Green”
   a. Light Transmission (visible): 58 percent.
   b. U-Value, Summer daytime: 0.28.
   c. U-Value, Winter nighttime: 0.29.
   d. Shading Coefficient: 0.34.
   e. Solar Heat Gain Coefficient: 0.30
10. Warranty: Manufacturer’s Ten year.

2.03 OPAQUE SPANDRELL LOW-E INSULATING GLASS

A. Material: Shall consist of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated.

B. Characteristics: Other requirements specified for glass characteristics, air space, sealing system, sealant spacer material, corner design and desiccant are as follows:

1. Thickness of Each Pane: 1/4 - inch.
2. Airspace Thickness: 1/2 - inch.
3. Sealing System: Manufacturer’s standard 1 inch sealing system.
4. Spacer Material: Manufacturer's standard metal-white.
5. Desiccant: Manufacturer's standard, either molecular sieve or silica gel.
6. Corner Construction: Manufacturer's standard.
7. Exterior Pane: Tinted; color – equal to “SuperNeutral 68 on Green” by SunGuard.
8. Reflective Coating: Clear with MSVD (Sputter) Low-E on 2nd (air space) surface.
9. Opaque Spandrel Coating: 3rd (air space) surface.

10. Unit Performance Requirements:
11. Light Transmission (visible): 0 percent.
12. U-Value, Summer daytime: 0.28.
13. U-Value, Winter nighttime: 0.29.
14. Shading Coefficient: 0.34.
15. Solar Heat Gain Coefficient: .30
16. Warranty: Manufacturer’s Ten year.

2.04 ACID ETCHED LOW-E INSULATION GLASS

A. Material: Shall consist of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated.

B. Characteristics: Other requirements specified for glass characteristics, air space, sealing system, sealant spacer material, corner design and desiccant are as follows:

1. Thickness of Each Pane: 1/4 - inch.
2. Airspace Thickness: 1/2 - inch.
3. Sealing System: Manufacturer’s standard 1 inch sealing system.
4. Spacer Material: Manufacturer's standard metal-white.
5. Desiccant: Manufacturer's standard, either molecular sieve or silica gel.
6. Corner Construction: Manufacturer's standard.
7. Exterior Pane: Tinted; color – equal to “SuperNeutral 68 (#2) Satin Deco” by SunGuard.
   a. Outboard Substrate: Green
   b. Inboard Substrate: SatinDeco
   c. Exterior Appearance: Green
8. Interior Pane: Clear with MSVD (Sputter) Low-E on 3rd (air space) surface.
9. Unit Performance Requirements:
   a. Light Transmission (visible): 56 percent.
   b. U-Value, Summer daytime: 0.28.
   c. U-Value, Winter nighttime: 0.29.
   d. Shading Coefficient: 0.34.
   e. Solar Heat Gain Coefficient: .30
10. Warranty: Manufacturer’s Ten year.

2.05 LAMINATED CLEAR SAFETY GLASS

A. Two layers of 1/8 inch glass Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select) with a 0.030 polyvinyl butyryl interlayer. Total thickness, 1/4 inch (plus). Unless shown otherwise on Drawings, use this type glass for all interior applications.

2.06 SETTING MATERIALS

A. Provide all necessary primers, sealants, channels, setting blocks, etc. with items to be glazed. Conform to requirements set forth in FGJA Glazing Manual.

PART 3 - EXECUTION

3.01 GLAZING INSTALLATION

A. Do not commence glazing Work until the required primers have been applied and have dried. Clean all surfaces to which setting materials are to be applied to assure that the materials properly adhere and seal.

B. Experienced glaziers having highest quality workmanship shall perform all glazing. Glass shall be set without springing or forcing. Putty, glazing compound, stops and the like shall not project above the sight line. Exposed surfaces of putty and glazing compound shall be left straight, flat and clean. Corners shall be well formed.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

D. Apply clear glazing compound around perimeter and at all glass-to-glass connections of butt-glazing system. Compound shall be the type recommended by the glass manufacturer for this particular installation.

3.02 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealant or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the Work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the Work. During installation, discard units with significant edge damage or other imperfections.

C. Glazing channel dimensions where shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thickness, with reasonable tolerances. Adjust as required by job conditions at time of installation.

D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated.

3.03 PREPARATION FOR GLAZING

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings that are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.04 GLAZING

A. Install setting blocks of proper size in sill rabbet, located one fourth of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or pre-shimmed tapes are used for glazing. Provide l/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Force sealant into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

E. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

F. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discoloration.

G. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel-bead.

3.05 CURE AND PROTECTION

A. Protect glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealant for high early strength and durability.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

3.06 CLEANING

A. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish Date of Completion in each area of Project. Comply with glass product manufacturer's recommendations for final cleaning.

B. The General Contractor shall be responsible for removal of protective materials and cleaning with plain water, or water with soap or household detergent as approved by the glass manufacturer. The General Contractor shall be held responsible for damages resulting from the use of other cleaning material.

END OF SECTION

SECTION 08 90 00 LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

1.02 PERFORMANCE REQUIREMENTS

A. Retain first paragraph below if Contractor is required to assume responsibility for design. It is advisable to delete below unless large louvers are used.

B. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

C. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft acting inward or outward.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural[and seismic] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 221 Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
3. For fastening stainless steel, use 300 series stainless-steel fasteners.
4. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.02 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a Mestek company.
b. Air Flow Company, Inc.
c. Greenheck Fan Corporation.
d. Ruskin Company; Tomkins PLC.

2. Louver Depth: 5 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Louver Performance Ratings:

a. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area intake velocity.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.04 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:

1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.05 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Clear Anodized

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 08 90 00

SECTION 08 92 00 GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Drawings: Plans, elevations and details show spacing of members, and profile and similar dimensional requirements of curtain wall work.

1.02 SUMMARY

A. This Section includes the following:

1. Glazed aluminum curtain wall, stick system installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07 21 00- Thermal Insulation for insulation materials and firesafing field installed in conjunction with glazed aluminum curtain wall system.
2. Section 07 92 00- Joint Sealants for joint sealants installed as part of glazed aluminum curtain wall system.
3. Section 08 43 13- Aluminum- Framed Storefronts.
4. Section 08 80 00- Glazing.

1.03 SYSTEM DESCRIPTION

A. General: Provide glazed aluminum curtain wall system that has the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:

B. General: Provide glazed aluminum curtain wall system that has the following capabilities based on preconstruction testing:

1. Withstands loads and thermal and structural movement requirements indicated without failure. Failure includes the following:

a. Air infiltration and water penetration exceeding specified limits.
b. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

C. Glazing is physically and thermally isolated from framing members.

D. System is pressure equalized at its interior face.

E. System is reglazable from the exterior.

F. Wind Loads: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

1. Deflection of framing members in a direction normal to wall plane is limited to 1/360 of clear span, 3/4 inches (19 mm) maximum, where plaster or gypsum board surfaces are subject to bending.
2. Test Performance: Provide glazed aluminum curtain wall system that does not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

    a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
    b. Duration: As required by design wind velocity; fastest 1 mile (1.609 km) of wind for relevant exposure category.

G. Seismic Loads: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

H. Dead Loads: Provide glazed aluminum curtain wall system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of fixed panels, glazing, or other fixed part immediately below. Provide a minimum 1/16-inch (1.59-mm) clearance between members and operable windows and doors.

I. Live Loads: Provide glazed aluminum curtain wall system, including anchorage, that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

J. Air Infiltration: Provide glazed aluminum curtain wall system with permanent resistance to air leakage through system of not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (299 Pa).

    1. Provide operable windows with permanent resistance to air leakage complying with AAMA 101 requirements for types of windows indicated.

K. Water Penetration: Provide glazed aluminum curtain wall system that does not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 10 lbf/sq. ft. (479 Pa).

L. Thermal Movements: Provide glazed aluminum curtain wall system, including anchorage, that accommodates thermal movements of system and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.

    1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

M. Structural Support Movement: Provide glazed aluminum curtain wall system that accommodates structural movements including, but not limited to, sway, twist, column shortening, long-term creep, and deflection.

N. Dimensional Tolerances: Provide glazed aluminum curtain wall system, including anchorage, that accommodates dimensional tolerances of building frame and other adjacent construction.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of glazed aluminum curtain wall system including plans, elevations, sections, details of components, and attachments to other units of Work.

1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for components with factory-applied color finishes.

E. Samples for verification of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

F. Installer certificates signed by manufacturer certifying that installers comply with requirements in "Quality Assurance" Article.

1.05 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the 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 glazed aluminum curtain wall systems that are similar to those indicated for this Project in material, design, and extent.

B. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing glazed aluminum curtain wall systems similar to those required for this Project and who is acceptable to manufacturer.
1. Engineering Responsibility: Prepare data for glazed aluminum curtain wall systems, including drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Source Limitations: Obtain each type of glazed aluminum curtain wall system from one source and by a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of a glazed aluminum curtain wall system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Noise or vibration caused by thermal movements.
3. Failure of system to meet performance requirements.
4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
5. Failure of operating components to function normally.
6. Water leakage.
7. Glazing breakage.

C. Warranty Period: Two (2) years from date of Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: All aluminum framing shall be equal to 1600 Wall System as shown on the drawings and as manufactured by Kawneer Company, Inc. Provide special shape aluminum fin trim as shown on drawings.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).

2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Glazing as specified in Section 08 80 00 – Glazing.

D. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; in hardness recommended by manufacturer.

E. Glazing sealants and fillers as specified in Section 08 80 00 – Glazing.

F. Framing system gaskets and joint fillers as recommended by manufacturer for joint type.

G. Sealants and joint fillers for joints within glazed aluminum curtain wall system as specified in Section 07 92 00 –Joint Sealants.

H. Insulating materials as specified in Section 07 21 00 Thermal Insulation.

I. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.03 COMPONENTS

A. Brackets and Reinforcements: Provide manufacturer's standard high-strength aluminum brackets and reinforcements. Provide nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Finish exposed portions to match glazed aluminum curtain wall.

1. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
2. Where fasteners anchor into aluminum less than 0.125 inch (3.2 mm) thick, provide reinforcement to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads finished to match framing members, unless otherwise indicated.

C. Anchors: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

E. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.

2.04 FABRICATION

A. General: Fabricate glazed aluminum curtain wall system according to Shop Drawings. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

E. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Frame Units: Factory assemble frame units according to Shop Drawings to greatest extent possible. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated. Assemble components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

1. Install glazing according to Shop Drawings. Comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

2.05 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

2.06 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of glazed aluminum curtain wall system. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to Architect have been made.

3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

D. Install framing members plumb and true in alignment with established lines and grades.

E. Install factory-assembled frame units plumb and true in alignment with established lines and grades.

F. Install column covers plumb and true in alignment with established lines and grades.

G. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.

1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

H. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

I. Install glazing according to Shop Drawings. Comply with requirements of Section 08 80 00 – Glazing, unless otherwise indicated.

J. Install sealant according to Shop Drawings. Comply with requirements of Section 07 92 00 - Joint Sealants, unless otherwise indicated.

K. Install insulation materials in locations indicated. Comply with requirements of Section 07 21 00 –Thermal Insulation, unless otherwise indicated.

L. Install firesafing in locations indicated. Comply with requirements of Section 07 84 00 - Fire-stopping, unless otherwise indicated.

M. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm); where a reveal or protruding element separates aligned surfaces by less than 2 inches (50.8 mm), limit offset to 1/2 inch (12.7 mm).
4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.03 FIELD QUALITY CONTROL

A. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure glazed aluminum curtain wall system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09 05 15 COLOR DESIGN

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: A coordinated comprehensive Color System in which requirements for materials specified in other Sections of this Specification and / or shown on the Drawings are identified for quality, color, finish, texture and pattern.

B. Related Sections: Section 01 33 00 - Submittal Procedures.

1.02 MANUFACTURER'S TRADE NAMES

A. Manufacture's trade names and number designations used herein identify colors, finishes, textures and patterns for materials and products specified in the technical sections of the Specifications. Wherever such products are referred for selection or approval in other sections, such products shall be understood to be referenced to this Section. If no selection is listed herein for products, the Project Engineer / MDOT Architect shall be contacted for a color selection. Subject to approval of the Project Engineer / MDOT Architect, products of other manufacturers will be considered, provided they are equivalent to the quality, colors, finishes, textures and patterns listed and meet the requirements of the Specifications and Drawings.

1.03 SAMPLES

A. Samples shall be submitted for approval prior to applying or installing any finishes or items that are not included in this Section. See appropriate technical Sections for submittal requirements. Upon receipt of samples, the Project Engineer / MDOT Architect may make revisions to the Color schedule.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials are specified in other Sections of the Specifications. Any reference by trade name or manufacturer shall be considered as establishing a standard of quality and shall in no way limit competition.

2.02 MANUFACTURERS

A. The following manufacturers were used in preparing the Color Schedule:

SECTION / MATERIAL	MANUFACTURER / NUMBER & COLOR NAME	COLOR DESCRIPTION
• 05 50 00 – Interior Metal Bollards	Safety Yellow	(yellow)
• 05 50 00 – Exterior Metal Bollards	Galvanized Steel	(silver/gray)
• 05 50 00 – Stair Steel & Railing	Safety Yellow	(yellow)
• 05 51 00 – Ext. Metal Stair Railing	Galvanized Steel	(silver/gray)
• 06 10 00 – Plywood Wainscot	Benjamin Moore OC119	(white)
• 06 40 00 – Architectural Woodwork Plastic Laminate -1	Wilsonart 7919K78 Amber Cherry	(wood tone)

• 06 40 00 – Solid Surface -1	Corian – Lava Rock	(brown/gray)
• 06 40 00 – Solid Surface – 2 Countertop	Corian – Whisper	(beige)
• 07 42 45 – Aluminum Composite Panel (wall)	Color to match exist. Materials Lab	(white)
• 07 42 45 – Aluminum Composite Panel (canopy)	Clear Anodized	(silver)
• 07 92 00 - Joint Sealants	Pecora (Match adjacent material inside & outside)	
• 08 11 13 - HM Dr & Frames (Int)	Benjamin Moore OC12 Muslin	(light tan)
• 08 14 00 - Wood Doors (stained)	#700 Dark Brown	(dark brown)
• 08 33 23 - Overhead Coiling Doors	Raynor –Steel	(sliver/gray)
• 08 41 13 - Alum Storefront	Kawneer-Clear anodized	(silver)
• 08 71 00 - Door Hardware	Satin Chrome	(silver)
• 08 90 00 - Louvers	Ruskin – Clear Anodized	(silver)
• 08 92 00 – Aluminum Curtainwall	Kawneer – clear anodized	(silver)
• 09 31 13 – Ceramic Tile	Daltile –desert Gray Speckle D200	(gray)
• 09 29 00 - Gypsum Board (Walls)	Benjamin Moore –OG12 Muslin	(light tan)
• 09 29 00 - Gypsum Board (Ceilings)	Benjamin Moore –Ceiling white	(white)
• 09 31 13 - Ceramic Flr. Tile POR1	Daltile D200 Desert Gray Speckle	(gray)
• 09 31 13 - Ceramic Flr. Tile POR2	Daltile D372 Sea Spec	(blue)
• 09 31 13 - Ceramic Wall Tile CT1	Daltile O135 Almond	(beige)
• 09 31 13 - Ceramic Wall Tile CT2	Daltile QF66 Tahoe	(blue)
• 09 31 13 - Grout (Floors)	Laticrete-Platinum -42	(gray)
• 09 31 13 - Grout (Walls)	Laticrete-Almond 85	(off white)
• 09 65 00 - Resilient Floor (VCT #1)	Armstrong Tile #52525	(pie car)
• 09 65 00 - Rubber Base	Johnsonite #63 Burnt Umber	(black/brown)
• 09 67 27 - Epoxy Resinous Flooring	Stonhard Steel Gray	(gray)
• 09 68 13 – Carpet Tile -1	Bigelow –Artist 7889 Freud	(multi- black / brown / blue)
• 09 77 00 –Special Wall Surfacing (FRP)	Glasbord -85 White	(white)
• 10 11 00 - Visual Display Board	Claridge – 7SLCS -11	(low gloss white)
• 10 11 00 - Tackboard	Claridge-Cork 1113 Steel Gray	(gray)
• 10 14 00 - ASI (Int-border)	SC 905 Black	(black)
• 10 14 00 - ASI (Int-background)	SC 922 Bone	(beige)
• 10 14 00 - ASI (Int-copy)	SC905 Black	(black)
• 10 21 15 - Toilet Partition	Scraton -Parchment	(tan)
• 10 51 13 - Metal Lockers	Penco - 826 Slate Blue	(blue)
• 10 56 13 – Metal Storage Shelving	Penco - 028 Gray	(gray)
• 10 73 16 – Aluminum Canopy	Clear Anodized	(silver)
• 10 82 15 – Arch Screen Wall Louver	Clear Anodized	(silver)
• 11 31 15 - Appliances (Range)	GE-white	(white)
• 11 31 15 - Appliances (Microwave)	GE-White	(white)
• 11 31 15 - Appliances (Refrigerator)	GE-White	(white)
• 12 21 13 – Horiz Lvr Blinds (at Windows)	Hunter Douglas-269 Chenille	(silver)
• 12 48 43 – Floor Mats	Pedimat 9325 Graphite	(black)

• 13 34 19 - Metal Building Main Roof	Ceco-Galvalume	(silver/gray)
• 13 34 19 - Roof Fascia & Rake	Ceco-Galvalume	(silver/gray)
• 13 34 19 - Soffit Panel	Ceco-Galvalume	(silver/gray)
• 13 34 19 - Str. Framing (Interior)	Benjamin Moore OC119	(white)

PART 3 - EXECUTION

3.01 EXECUTION, GENERAL

A. Refer to execution requirements specified in other Sections of this Specification for the specific products listed. Any remaining colors, finishes, textures or patterns not included in this Color Design will be selected by the Project Engineer / MDOT Architect upon written notification and subsequent submittals by the Contractor.

END OF SECTION

SECTION 09 29 00 GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Nonload-bearing steel framing members for gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.
3. Gypsum board assemblies attached to wood framing.
4. Glass-mat, water-resistant gypsum backing board installed with gypsum board assemblies.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05 41 33 "Cold-Formed Exterior Steel Stud Framing" for load-bearing steel framing.
2. Section 06 10 00 "Rough Carpentry" for wood framing and furring, and gypsum sheathing applied over wood framing.
3. Section 09 31 13 "Thin-Set Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.03 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.04 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.05 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 product specified.

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:

1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.08 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Steel Framing and Furring:

a. Consolidated Systems, Inc.
b. Dale Industries, Inc.
c. Marino/Ware (formerly Marino Industries Corp.).
d. National Gypsum Co.; Gold Bond Building Products Division.

2. Grid Suspension Assemblies:

   a. Armstrong World Industries, Inc.
   b. Chicago Metallic Corp.
   c. USG Interiors, Inc.
   d. Worthington Steel Company (formerly National Rolling Mills).

3. Gypsum Board and Related Products:

   a. Georgia-Pacific Corp.
   b. National Gypsum Co.; Gold Bond Building Products Division.
   c. United States Gypsum Co.

2.02 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for conditions indicated.

B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190 conducted by a qualified independent testing agency.

C. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.

D. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.

E. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.

F. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.

G. Angle-Type Hangers: Angles with legs not less than 7/8 inch (22.2 mm) wide, formed from 0.0635-inch- (1.6-mm-) thick galvanized steel sheet complying with ASTM A 653, G 90 (ASTM A 653M, Z 180) coating designation, with bolted connections and 5/16-inch (8-mm) diameter bolts.

H. Channels: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:

   1. Carrying Channels: 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (70 kg/100 m), unless otherwise indicated.
   2. Furring Channels: 3/4 inch (19.1 mm) deep, 300 lb/1000 feet (45 kg/100 m), unless otherwise indicated.
   3. Finish: Rust-inhibitive paint, unless otherwise indicated.
   4. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.

I. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

   1. Depth: 2-1/2 inches (63.5 mm), unless otherwise indicated.
   2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.

3. Depth: As indicated.
4. Protective Coating: Manufacturer's standard corrosion-resistant coating.

J. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch (22.2 mm), and minimum thickness of base (uncoated) metal as follows:

1. Protective Coating: Manufacturer's standard corrosion-resistant coating.

K. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.03 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Protective Coating: Manufacturer's standard corrosion-resistant coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 20 gauge unless otherwise indicated.
2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
3. Depth: 6 inches (152.4 mm) where indicated.
4. Depth: 2-1/2 inches (63.5 mm) where indicated.

C. Deflection Track: Manufacturer's top runner complying with the requirements of ASTM C 645 and with 2-inch- (50.8-mm-) deep flanges.

D. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M). Thickness as indicated for studs, and width to accommodated depth of studs, and of the following configuration:

1. Top Runner with Compressible Flanges: 2-1/2-inch- (63.5-mm-) deep flanges with V-shaped offsets that compress when pressure is applied from construction above.

E. Deflection and Firestop Track: Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset at midpoint to accommodate gypsum board thickness.

F. Z-Furring Members: Manufacturer's standard Z-shaped furring members with slotted or non-slotted web, fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M); with a minimum base metal (uncoated) thickness of 0.0179 inch (0.45 mm), face flange of 1-1/4 inch (31.8 mm), wall-attachment flange of 7/8 inch (22.2 mm), and of depth required to fit insulation thickness indicated.

G. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (45 kg/100 m), unless otherwise indicated.

H. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:

1. Thickness: 0.0179 inch (0.45 mm), unless otherwise indicated.

I. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.04 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).

B. Gypsum Wallboard: ASTM C 36 and as follows:

1. Type: Type X where required for fire-resistance-rated assemblies – all gypsym board uses.
2. Edges: Tapered.
3. Thickness: 5/8 inch (15.9 mm) where indicated.

C. Water-Resistant Gypsum Backing Board: ASTM C 630 and as follows:

1. Type: Type X for fire-resistance-rated assemblies and where indicated.
2. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.

D. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
1. Product: Subject to compliance with requirements, provide “Dens-Glass Gold” by G-P Gypsum Corporation or approved equal.
2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

E. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion that standard, regular-type and Type X gypsum board.
1. Long Edges: Tapered.
2. Thickness: 5/8 inch (15.9 mm) thick.

2.05 CEMENTITIOUS BACKER UNITS

A. Provide cementitious backer units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: 5/8 inch (15.9 mm), where indicated.

2.06 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal or plastic, with metal complying with the following requirement:

   a. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

   a. Cornerbead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
   c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
   d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
   e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

B. Accessory for Curved Edges: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.

C. Accessories for Exterior Installations: Cornerbead, edge trim, and control joints formed from steel sheet zinc coated by hot-dip process or rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to Fig. 1 designations in ASTM C 1047.

   1. Cornerbead on outside corners, unless otherwise indicated.
   2. Edge trim complying with shape LC-bead per Fig. 1, unless otherwise indicated.
   3. One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening.

D. Aluminum Accessories: Where indicated, provide manufacturer's standard extruded-aluminum accessories of profile indicated complying with the following requirements:

   1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.

      a. Color: As selected by Architect from manufacturer's standard colors.

   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering aluminum accessories that may be incorporated in the Work include, but are not limited to, the following:

      a. Fry Reglet Corp.
      b. MM Systems, Inc.
      c. Pittcon Industries, Inc.

2.07 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.

a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
b. Topping compound formulated for fill (second) and finish (third) coats.
c. All-purpose compound formulated for both taping and topping compounds.

E. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

2.08 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

D. Fastening Adhesive for Wood: ASTM C 557.

E. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

F. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
2. Fastening gypsum board to wood members.
3. Fastening gypsum board to gypsum board.

G. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

H. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.

I. Gypsum Board Nails: ASTM C 514.

J. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches (600 mm) o.c.

C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board assemblies without reducing thickness of fireproofing below that is required to obtain fire-resistance rating indicated. Protect remaining fireproofing from damage.

3.03 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.
2. Where partition framing and wall furring abut structure, except at floor.

a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
b. Install deflection track top runner to attain lateral support and avoid axial loading.
c. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.

1) Attach jamb studs at openings to tracks using manufacturer's standard stud clip.

D. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.04 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Screw furring members to framing.

B. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

C. Sway-brace suspended steel framing with hangers used for support.

D. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.

1. Wire Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 24 inches (610 mm) o.c.

E. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) as measured both lengthwise on each member and transversely between parallel members.

F. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

H. For exterior soffits, install cross-bracing and additional framing to resist wind uplift according to details on drawings.

3.05 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Terminate partition framing at deck for all walls unless shown otherwise.

E. Install steel studs and furring in sizes and at spacings indicated.

1. Single-Layer Construction: Space studs 24 inches (610 mm) o.c., unless otherwise indicated.
2. Cementitious Backer Unit Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.

F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

G. For curved partitions, install steel framing as follows:

1. Cut top and bottom runners through leg and web at 2-inch (50-mm) intervals for arc length. In cutting lengths of runners, allow for uncut straight lengths of not less than 12 inches (300 mm) at ends of arcs.
2. Bend runners to uniform curve of radius indicated and locate straight lengths so they are tangent to arcs.
3. Support outside (cut) leg of runners by clinching a 1-inch- (25-mm-) high-by-0.0209-inch-(0.55-mm-) thick steel sheet strip to inside of cut legs using metal lock fasteners.
4. Attach runners to structural elements at floor and ceiling with fasteners located 2 inches (50 mm) from ends and spaced 24 inches (610 mm) o.c.
5. Position studs vertically with open sides facing in same direction and engaging floor and ceiling runners. Begin and end each arc with a stud and space intermediate studs equally along arcs at stud spacing recommended by gypsum board manufacturer for radii indicated. Attach studs to runners with 3/8-inch- (9.5-mm-) long pan head framing screws. On straight lengths at ends of arcs, place studs 6 inches (150 mm) o.c. with last stud left free standing.

H. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install 2 studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

I. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.06 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.

I. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

J. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

K. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

L. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

M. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

N. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

O. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

P. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.07 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.

   a. Stagger abutting end joints not less than one framing member in alternate courses of board.
   b. At stairwells and other high walls, install panels horizontally.

4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:

1. Install glass-mat, water-resistant gypsum backing board panels to comply with manufacturer's installation instructions at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.
2. Install glass-mat, water-resistant gypsum backing board panels to comply with manufacturer's installation instructions at locations indicated to receive wall tile. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

D. Direct-Bonding to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.08 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner bead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
3. Install U-bead where indicated.
4. Install aluminum trim and other accessories where indicated.

D. Install control joints at locations indicated but not to exceed 30’ o.c.

E. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.09 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2 where panels form substrates for tile and where indicated.
3. Level 2 for gypsum board where indicated.
4. Level 3 for gypsum board where indicated.
5. Level 4 for gypsum board surfaces, unless otherwise indicated.
6. Level 5 for gypsum board surfaces where indicated.

E. Finish glass-mat, water-resistant gypsum backing board to comply with gypsum board manufacturer's directions.

F. Finish cementitious backer units to comply with unit manufacturer's directions.

3.10 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
2. Prior to notifying Architect, complete the following in areas to receive gypsum board ceilings:

a. Installation of 80 percent of lighting fixtures, powered for operation.
b. Installation, insulation, and leak and pressure testing of water piping systems.
c. Installation of air duct systems.
d. Installation of air devices.
e. Installation of mechanical system control air tubing.
f. Installation of ceiling support framing.

3.11 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09 31 13 THIN-SET CERAMIC TILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Thin set ceramic mosaic floor tile, glazed cove base, wall tile and accessories.

1.02 RELATED SECTIONS

A. Section 07 26 00 – Vapor Retarders (Floor protection paper).

B. Section 09 29 00 – Gypsum Board (For cement based backer board).

C. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Submit manufacturer’s product data and written instructions for recommended installation and maintenance practices for each product specified.

B. Submit 2 samples of types and colors of tile and grout required in similar pattern of tile shown on Drawings, mounted on not less than 12 inches square plywood or hardboard and grouted as required.

C. Submit one full size sample of each tile accessory and marble threshold. Submit samples of trim and other units if requested by the Project Engineer / MDOT Architect. Review will be for color, pattern and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.04 QUALITY ASSURANCE

A. Furnish tile conforming to the Standard Grade Requirements of ANSI A137.1.

B. When using setting and grouting materials manufactured under TCNA license, include identification, and formula number on each container. Provide materials obtained from only one source for each type of tile, grout and color to minimize variations in appearance and quality.

C. Install ceramic tile in accordance with manufacturers instructions and applicable installation specifications of the Tile Council of North America's "Handbook for Ceramic Tile Installation", latest edition.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's directions.

1.06 PROJECT CONDITIONS

A. Continuously heat areas to receive tile to 50 degrees F. for at least 48 hours prior to installation, when project conditions are such that heating is required. Maintain 50 degrees F. temperature continuously during and after installation as recommended by tile manufacturer but not less than 7 days. Maintain a minimum lighting level of 50 fc during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. American Olean Tile Company, Lansdale, Pennsylvania
2. Dal-Tile Corporation, Dallas, Texas
3. Floor Gres Ceramiche, Italy
4. Florida Tile Industries, Lakeland, Florida.
5. United States Ceramic Tile Co., East Spatra, Ohio

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 MATERIALS

A. Ceramic Floor Tile: 12 inches by 12 inches by 5/16 inch, cushioned edge, unglazed, color to be selected from standard colors available.

B. Ceramic Base Tile: 6 inches by 6 inches by 5/16 inch, cushioned edge, bright glaze, cove base round top, color to be selected from standard colors available.

C. Glazed Wall Tile: Size 6 inches by 6 inches by 5/16 inch, cushioned edge, bright glaze, colors to be selected from standard colors available.

D. Trim And Special Shapes: Provide necessary units with rounded internal and external corners, and rounded internal and external corner units of same material and finish as field tile, and as follows:

1. Base: Sanitary cove units.
2. External Corners: Bullnose shapes, with a radius of not less than 3/4 inch, unless otherwise shown.
3. Internal Corners: Field-butted square, except use square corner, combination angle and stretcher type cap.

E. Marble Thresholds: Provide sound Group "A" marble with an abrasive hardness of not less than 10.0, when tested in accordance with ASTM C 241. Color of marble threshold to be selected by the Project Engineer / MDOT Architect from manufacturer’s full range of standard colors.

F. Adhesive: ANSI A136.1 and ANSI A118.4 when mixed with additive, with Tile Contractor's Association or Adhesive and Sealant Council certification of conformance, for base and wall tile set on each type of substrate. Provide primer-sealer as recommended by adhesive manufacturer. Equal to Laticrete Type 272 Premium or 317 Floor ‘N Wall Thin-Set with 333 Super Flex Additive. Equivalent products by Mapei and Bostik are acceptable.

G. Grout: ANSI A 118.3, with Tile Contractor’s Association certification of conformance. Equal to Laticrete Type SpectraLOCK Pro Grout.

1. Equivalent products by Custom Building Products and Mapei are acceptable. Color of grout to be selected by the MDOT Architect from manufacturer’s full range of standard colors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine the substrate and the conditions under which ceramic tile is to be installed and notify the contractor in writing of any conditions detrimental to the proper and timely completion of the Work.

B. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION

A. Comply with the applicable parts of ANSI 108 Series of tile installation standards included under “American National Standard Specifications for the Installation of Ceramic Tile", and the tile and grout manufacturer's printed instructions, and applicable installation specifications of the Tile Council of North America's "Handbook for Ceramic Tile Installation", latest edition.

B. Handle, store, mix and apply proprietary setting and grouting materials in compliance with the manufacturer's instructions.

C. Extend tile Work into recesses and under equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate Work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping, and fixtures so that plates, collars, or covers overlap tile.

E. Stainless steel edging profiles to be installed simultaneous with the tile, for wall and floor applications.

3.03 JOINTING PATTERN

A. Unless otherwise shown, lay tile in grid pattern. Align joints where adjoining tiles on floor, base, walls and trim are the same size. Layout tile Work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

3.04 COLOR PATTERN

A. A simple color pattern shall be provided with approved color chart and sample submittal to Contractor using 3 or less colors on walls and floors.

3.05 CLEANING AND PROTECTION

A. Cleaning: Clean grout and setting materials from face of tile while materials are workable. Leave tiles face clean and free of all foreign matter. Unglazed tile may be cleaned with acid solutions only when permitted by the tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush the surface with clean water before and 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 by covering with floor protection paper during the construction period to prevent damage and wear. Prohibit all foot and wheel traffic from using tiled floors for 7 days after installation. Before final inspection, remove protective covering and rinse neutral cleaner from all tile surfaces.

END OF SECTION

SECTION 09 51 00 ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Lay-in acoustical panels (2’ by 2’ Grids) for metal ceiling suspension systems.

B. Suspended metal grid system complete with wall trim.

1.02 RELATED SECTIONS

A. Section 07 21 00 – Thermal Insulation.

B. Section 09 29 00 – Gypsum Board.

C. Division 23 for Mechanical Requirements.

D. Division 26 for Electrical Requirements.

1.03 SUBMITTALS

A. Manufacturer's product specifications, samples, and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods that may be detrimental to finishes and acoustical performances.

1.04 QUALITY ASSURANCE

A. Installer shall be a company with not less than 3 years of documented successful experience in installation of acoustical ceilings similar to requirements for this Project and acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer (required for approval).

1.05 PROJECT CONDITIONS

A. Do not install interior acoustical ceilings until the following conditions are met:

1. Space is enclosed and weatherproof.
2. Wet work in space completed and nominally dry.
3. Work above ceilings is completed.
4. Ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Maintain a light level of a minimum of 50 fc during entire installation.

1.06 PROJECT COORDINATION

A. It shall be this contractor's responsibility to coordinate with mechanical and electrical trades with respect to their requirements for additional suspension system components. Any additional components required shall be furnished and installed by this contractor.

1.07 MAINTENANCE STOCK

A. At time of completing installation, deliver stock of maintenance material to Owner. Furnish full size units matching units installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish amount equal to 2 percent of acoustical units and exposed suspension installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

A. Provide manufacturer's standard lay-in panels of type recommended by manufacturer for application indicated. Provide sizes shown by reflected ceiling plans or, if not otherwise indicated, 2’ by 2’ grid-size panels, with white washable finish.

B. Mineral Fiber Acoustical Tile: Provide units with Intersept Antimicrobial solution (MOLD AND MILDEW GUARD) not less than 5/8-inch thick and of density not less than l0 pounds per cubit foot, medium-coarse non-directional texture, NRC 0.50 to 0.60, CAC 25 to 33, light reflectance over 75 percent. Products offered by manufacturers to comply with requirements include the following:

1. No. 770 Cortega Square Edge; Armstrong World Industries, Inc.
2. Van-157 Vantage 10 Trim Edge ; CertainTeed/BPB Celotex.
3. No. 2210 Radar ClimaPlus Square Edge; U.S. Gypsum Co.

2.02 CEILING SUSPENSION MATERIALS

A. Comply with ASTM C 635, as applicable to type of suspension system required for type of ceiling units indicated. Coordinate with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, and partition system (if any). Structural Class of the system shall be intermediate-duty.

B. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table l, Direct Hung.

1. Hanger Wires: Galvanized carbon steel, ASTM A 64l, soft temper pre-stretched, yield-stress load of at least 3 times design load, but not less than l2 gage (0.l06 inch).
2. Type of System: Either direct or indirect-hung suspension system, at Contractor's option.
3. System Manufacturer: Same as acoustical unit manufacturer or one of the following:
   a. Chicago Metallic Corp. Donn Corp.
   b. W. J. Haertel Div.; Leslie-Locke.
   c. National Rolling Mills Co. Roblin Building Products Roper.
   d. Eastern Building Systems.

C. Edge Moldings: Manufacturer's standard channel molding for edges and penetrations of ceiling, with single flange of molding exposed, white baked enamel finish unless otherwise indicated.

D. Exposed Suspension System: Manufacturer's standard exposed runners, cross-runners and accessories, or types and profiles indicated, with exposed cross runners coped to lay flush with main runners. Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system, including moldings, trim, and accessories. Use manufacturer's standard baked enamel finish, white unless otherwise selected by MDOT Architect.

2.03 MISCELLANEOUS MATERIALS

A. Edge Trim Molding: Metal or extruded PVC plastic, of types and profiles indicated, white finish unless otherwise indicated.

B. Hold-Down Clips: Where required for wind uplift resistance or fire-resistance rating, provide standard spring steel clips, except provide accessible type at locations indicated on drawings.

PART 3 - EXECUTION

3.01 COORDINATION

A. Mechanical and electrical work above suspended ceiling shall be strictly coordinated with the work in this Section.

3.02 EXAMINATION

A. Installer must examine conditions under which acoustical ceiling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.03 PREPARATION

A. Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.04 INSTALLATION

A. Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the Work.

B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers near each end and spaced 4 feet along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of l/8 inch in l2 feet. 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 temperatures.

C. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Screw-attach moldings to substrate at intervals not over l6 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of l/8 inch in l2 feet. Miter corners accurately and connect securely.

D. 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. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire- resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.05 ADJUSTING AND CLEANING

A. Adjust sags or twists which develop in the ceiling system and replace parts that are damaged or faulty.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00 RESILIENT FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vinyl Composition Tile (V.C.T.) Flooring, Vinyl Base, and Accessories.

1.02 RELATED SECTIONS

A. Section 07 26 00 – Vapor Retarders (Floor protection paper).

B. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Submit manufacturer's product data and written instructions for recommended installation and maintenance practices for each type of resilient flooring and accessories.

B. Submit complete line of color samples for selection.

1.04 QUALITY ASSURANCE

A. Wherever possible, provide resilient flooring, adhesives, cleaners, polishes and accessories produced by a single manufacturer.

B. Secure the service of an experienced, professional floor service to provide necessary equipment and manpower to complete the Work.

1.05 PROJECT CONDITIONS

A. Continuously heat areas to receive flooring to 70 degrees F. for at least 48 hours prior to installation, when project conditions are such that heating is required. Maintain 70 degrees F. temperature continuously during and after installation as recommended by flooring manufacturer but not less than 48 hours. Maintain a minimum lighting level of 50 fc during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Armstrong Commercial Flooring, PO Box 3001, Lancaster, PA 17604 Tel. No. (800) 292-6308.

B. Equivalent products by the following manufacturers are acceptable:

1. Mannington Commercial, Calhoun, GA, Tel. No. (800) 241-2262.
2. Azrock Commercial Flooring, Florence, AL. Tel. No. (800) 558-2240.
3. Johnsonite, Chagrin Falls, OH. Tel. No. (800) 899-8916.

C. Alternate manufacturers: Products produced by other manufacturers that fully meet or exceed the specified requirements may be considered under provisions of Section 01 62 14-Product Options and Substitution Procedures.

2.02 TILE FLOORING

A. Vinyl Composition Tile: ASTM F 1066: Composition 1, Class 2, Premium Visual Tile, as manufactured by Armstrong Commercial.

B. Size: 12 inches by 12 inches.

C. Thickness: 1/8 inch gage.

D. Color: Color to be selected by Project Engineer / MDOT Architect from manufacturer's full range of Multi-Color Premium colors. Refer to Section 09 05 15 – Color Design.

2.03 ACCESSORIES

A. Provide rubber base complying with ASTM F-1861, Type TP, Group 1 (solid) Standard Specification for Resilient Wall Base, with matching end stops and preformed or molded corner units. Base shall be 4 inches high, 0.125 inch gage, length 120 feet, standard top-set cove.

B. Resilient Edge Strips: 1/8-inch thick, homogenous vinyl of rubber composition, tapered or bullnose edge, color to match flooring, or as selected by MDOT Architect from standard colors available; not less than 1 inch wide.

C. Adhesives (Cements): As recommended by flooring manufacturer to suit material and substrate conditions.

D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine the areas and conditions under which resilient flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION

A. Acclimate tile and base to job site conditions for at least 48 hours prior to installation. Prior to laying flooring, broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed Work.

B. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

C. Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.

3.03 INSTALLATION

A. Install flooring after finishing operations, including painting, have been completed and permanent-heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by flooring manufacturer.

B. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

1. Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers.
2. Tightly cement edges to perimeter of floor around corners and to corners. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

D. Tile Flooring: Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are 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, unless otherwise shown. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tiles are not acceptable.

1. Tightly cement tile to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.
2. LAY TILE WITH GRAIN IN ALL TILES RUNNING IN THE SAME DIRECTION.

E. Accessories: Apply resilient base to walls, columns, pilaster, casework and other permanent fixtures in rooms or areas where base is required. Install base in as long lengths as practicable (continuous between openings and wall to wall), with preformed corner units. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at all unprotected edges of flooring, unless otherwise shown. Comply with manufacturer's written instructions for installing resilient base.

3.04 PATTERN

A. A simple color pattern shall be provided to Contractor with approved color chart and sample submittal using 3 or less colors.

3.05 CLEANING AND PROTECTION

A. Initial Cleaning: Remove excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.

B. Maintenance Immediately After Installation:

1. Do not wash or scrub the floor for 5 days after installation to allow the floor tiles to bond to the underlayment / subfloor.
2. Keep heavy furniture and equipment off the floor at least 48 hours to allow the adhesive to set.
3. Sweet or vacuum thoroughly, and remove residual adhesive with a clean white cloth dampened with cleaners as recommended by flooring manufacturer.
4. Apply 3 coats of manufacturers recommended high-quality cross-linked acrylic floor polish, allowing 60 minutes drying time between applications.

C. Protection: Protect installed flooring from damage by covering with floor protection paper.

D. Finishing: After completion of project and just prior to final inspection of Work, scrub the floor using a good quality non-alkaline cleaner and a floor machine of 170-250 rpm equipped with a green or blue scrubbing pad.

1. Thoroughly rinse the floor (avoid flooding the floor) and allow the floor to dry completely.
2. Apply 3 coats of manufacturers recommended high-quality, cross-linked acrylic floor polish, allowing 60 minutes between applications.
3. After polish is completely dry, spray buff using a diluted (7 - 8 percent solids) floor polish. Before the liquid is dry, buff with a floor machine equipped with a white or tan buffing pad or a soft brush at 170-700 rpm. Buff until the liquid is dry and a thin glossy film remains.
4. Protect completed Work from traffic and damage until acceptance by the Owner.

END OF SECTION

SECTION 09 67 27 EPOXY RESINOUS FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. High-performance poured in place resinous flooring.

B. Related Sections include the following:

1. Section 03 30 00 "Cast-in-Place Concrete" for concrete substrates to receive resinous flooring.

2. Section 09 05 15 “Color Design.”

1.03 SUBMITTALS

A. Product Data: For each type of product specified. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for each resinous flooring system indicated.

C. Maintenance Data: For resinous flooring to include in the maintenance manuals specified in Division 1.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing epoxy resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to epoxy resinous flooring manufacturer.

1. Engage an installer who employs only persons trained and approved by epoxy resinous flooring manufacturer for installing epoxy resinous flooring systems specified.

B. Source Limitations: Obtain primary epoxy resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Field Samples: On floor area selected by Architect, provide full-thickness epoxy resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.

1. If field samples are unacceptable, make adjustments to comply with requirements and apply additional samples until field samples are approved.
2. After field samples are approved, these surfaces will be used to evaluate resinous flooring.
3. Obtain Architect's approval of field samples before applying resinous flooring.
4. Final approval of colors will be from field samples, not samples submitted for verification.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with epoxy resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Epoxy Resinous Flooring Schedule at the end of Part 3.

2.02 MATERIALS

A. Epoxy Resinous Flooring: Resinous floor three-component, troweled, epoxy mortar surfacing system. System consisting of primer; body coat(s) including resin, hardener, aggregates, curving agents, and colorants, if any; and sealing or finish coat(s). Comply with requirements indicated below.

1. System equal to Stonhard Stonclad GS with Stonkote GS4 topcoat.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

C. Joint Sealant: Basis of design Stonflex MP7. Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

D. Surface Texture: Texture to be included in surface finish based on Owner requirements. Texture to be on a scale of 2-3 according to Stonhard's Texture Scale.

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminates incompatible with resinous flooring.

1. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

C. Epoxy Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Mark locations of floor control joints prior to installation of epoxy resinous floor.

3.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

   a. Apply joint sealant to comply with manufacturer's written recommendations, to maintain a seamless floor.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Apply self-leveling slurry body coat(s) in thickness indicated.

1. Broadcast aggregates and, after resin is cured, remove excess aggregates to provide surface texture indicated.

E. Apply troweled or screeded body coat(s) in thickness indicated. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

F. Apply sealing or finish coat(s), including grout coat, if any, of type recommended by resinous flooring manufacturer to produce finish indicated. Apply in number of coats and at spreading rates recommended in writing by manufacturer. Surface texture to be on a 2-3 scale based on Stonhard's texture scale.

3.03 CLEANING AND PROTECTING

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

3.04 INSTALLATION SCHEDULE

A. Resinous Floor Installation: where interior floor installations of this designation are indicated, comply with the following
   1. Floor Type:
      a. Code: StonHard 1
      b. Style: StonClad GS/GS4
      c. Color : TBS

B. At all electric panel boxes provide yellow Caution striping (as directed by Owner).

END OF SECTION

SECTION 09 68 13 CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Carpet tile and Loop construction, tufted.

B. Related Sections include the following:

1. Section 09 65 00 “Resilient Flooring” for resilient wall base and accessories installed with carpet.
2. Section 09 05 15 “Color Design” for color selection.

1.02 SUBMITTALS

A. Samples:

1. Submit two samples, 12 inches x 12 inches in size illustrating color and pattern for each carpet material specified.
2. Samples: Submit finish and color samples of contour edge transition materials.

B. Manufacturers Installation Instructions: Indicate special procedures.

C. Maintenance Data: Include maintenance procedures; recommend maintenance material and suggested schedule for cleaning.

D. Qualification Data: For Installer.

1.03 EXTRA MATERIALS

A. Provide Owner with overage stock of 10 percent of Carpet Tile.

PART 2 - PRODUCTS

2.01 CARPET

A. Products: Subject to compliance with requirements, provide the following:

1. Manufacturer: Bigelow

Style Name& Color:	Artist BT199/ Color: Freud 7889
Pile Construction:	Tufted Loop
Face Yarn:	Solution Dyed Nylon / Space Dyed Nylon
Tufted Pile Weight:	20 Ounces
Pile Thickness:	0.147”high / 2/32 inch low
Gauge:	1/10
Stitched Per Inch:	11.0
Backing:	Ultra-Set RC-Fiberglass Reinforced Thermoplastic Composite Tile
Size	24” x 24”
Density:	4,898
Protective Treatment:	Sentry Plus

Pattern Repeat:	Not Applicable
Flammability:	ASTM E648 Class I, Glue Down
IAG Green Cable Plus	1098
CRI Appearance	Severe Traffic
Flooring Radiant panel:	Meets NFPA Class 1 under ASTM E-648
Wear Warranty:	Lifetime Limited Modular Warranty Lifetime Static

B. Equivalent products by the following manufacturers are acceptable:

1. Bentley Prince Interface, Inc. City of Industry, CA. Tel. (800) 423-4709.
2. Patcraft Commercial Carpet, Dalton, GA. Tel. (800) 241-4014.

D. Alternate manufacturers: Materials produced by other manufacturers that fully meet or exceed the specified requirements may be considered under the provisions of Section 01 62 14-Product Options and Substitution Procedures.

2.02 ACCESSORIES

A. Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or as recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.

C. Contact Adhesive: Compatible with carpet material; resealable type. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are smooth and flat with maximum variation not exceeding 1/4 inch in 10 feet and area ready to receive work.

B. Examine substrate for moisture content and other conditions under which carpeting is to be installed, and notify the Contractor in writing of conditions detrimental to proper completion of the work.

C. Verify that floor mounted utilities are in correct location.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless manufacturer requires more stringent requirements in their written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

E. Sequence carpeting with other Work so as to minimize the possibility of damage and soiling of carpet during the remainder of the construction period.

3.03 INSTALLATION

A. Comply with CRI 104 and carpet manufacturers' written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, and “Direct Glue-Down Installation."

B. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

C. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device

E. Cut and fit carpet tight to interruptions. Terminate carpet with edge strips at dissimilar materials.

F. Install pattern parallel to walls and borders to comply with CRI Carpet Tile installations and with carpet manufacturer's written recommendations. Carpet tile to be installed in a monolithic pattern. Review with Architect’s representative on site, prior to installation to verify pattern layout.

3.04 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove excess adhesive from floor, base and wall surfaces without damage, using cleaning recommended by carpet manufacturer.
3. Remove yarns that protrude from carpet surface.
4. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, and “Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet cushion and adhesive manufacturers.

3.5 Schedule:

A. Refer to drawings for extent of work in this section.

END OF SECTION

SECTION 09 77 00 SPECIAL WALL SURFACING (FRP)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:

1. Section 06 10 00 "Rough Carpentry" for wood furring for installing plastic paneling.

2. Section 09 05 15 “Color Design.”

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For plastic paneling and trim accessories.

C. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.
3. Testing Agency: FM Approvals.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.01 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kemlite Company Inc.
b. Marlite.
c. Glasbord

2. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
3. Surface Finish: Smooth.
4. Color: White.

2.02 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: White.

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Adhesive: As recommended by plastic paneling manufacturer.

1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 7 Section "Joint Sealants."

1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove loose or soluble paint and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints where indicated to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches (300 mm) wide.

1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.03 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.

1. Drill oversized fastener holes in panels and center fasteners in holes.
2. Apply sealant to fastener holes before installing fasteners.

D. Install factory-laminated panels using concealed mounting splines in panel joints.

E. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

SECTION 09 90 00 PAINTING AND COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Painting and finishing of exterior and interior exposed items and surfaces throughout the project, except as otherwise indicated. Surface preparation, priming and finish coats specified in this Section are in addition to shop priming and surface treatment specified under other Sections of the Work.

B. The Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical Work, except as otherwise indicated.

C. "Paint" 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.

D. Paint all exposed surfaces whether or not colors are designated in "schedules", except where the natural finish of the material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the Architect will select these from standard colors available for the materials system specified.

E. Extra Materials: Deliver to Owner a 1-gal. Container, properly labeled and sealed, of each color and type of finish coat paint used on Project and with readable labels.

1.02 PAINTING NOT INCLUDED

A. The following categories of Work are not included as parts of the field-applied finish Work, or are included in other Sections of these Specifications.

B. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various Sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated or factory-built mechanical and electrical equipment or accessories.

C. 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) plastic toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixture, switch-gear and distribution cabinets, elevator entrance frames, door and equipment.

D. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundations spaced, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

E. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

F. Operating Parts and Labels: 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, unless otherwise indicated. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.03 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including basic materials analysis and application instructions for each coating material specified.

B. Paint Systems: Comply with Article 2.04 indicating each type of primer and top coat required for each substrate by product name and number.

C. Samples: Submit color samples for selection by Architect from manufacturer’s full range of colors. Indicate submitted manufacturer’s CLOSEST STANDARD COLORS that match colors specified.

D. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Architect at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating or fail to meet the performance criteria of the specified materials will not be approved. All primers and topcoats plus the seam sealer and pit filler shall be furnished by the same manufacturer to ensure compatibility.

1.05 QUALITY ASSURANCE

A. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes as specified. On at least 100 square feet of surface as directed, provide full-coat finish samples until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place Work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the 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 under cover, protected from inclement weather and adverse temperature extremes, in original containers or unopened packages, in accordance with manufacturer’s instructions.

1.07 PROJECT CONDITIONS

A. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instruction. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by the Sherwin-Williams Company, 101 Prospect Avenue NW, Cleveland, OH 44115. Tel. (800) 321-8194.

B. Equivalent products by the following manufacturers are acceptable:

1. Benjamin Moore & Company, Montvale, NJ. Tel. (800) 344-0400.
2. Farrell-Calhoun Paint, Memphis, TN. Tel. (901) 526-2211.
3. Tnemec Company Inc., Kansas City, Missouri. Tel. (800) 863-6321.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures

2.02 COLORS AND FINISHES

A. Paint colors, surface treatments, and finishes will be selected from color chips submitted by contractor. Prior to beginning Work, the Architect will select color chips for surfaces to be painted. Use representative colors when preparing samples for review. Final acceptance of colors will be from samples.

B. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated. Lead content in the pigment, if any, is limited to contain not more than 0.5 percent lead, as lead metal based on the total non-volatile (dry-film) of the paint by weight.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coats system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials provided for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primer or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.03 MATERIAL QUALITY

A. Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best grade product WILL NOT BE ACCEPTED. Proprietary names used to designate colors or materials are not intended to imply that products of the named manufacturers are required to the exclusion of equivalent products of other manufacturers.

B. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within recommended limits.

2.04 PAINT SYSTEMS

A. Provide the following paint systems for the various substrates, as indicated.

B. Exterior Paint Systems are as follows:

1. Ferrous and Zinc Coated Metal
   1st Coat: S-W ProCryl® Universal Primer, B66-310 Series (2-4 mils dry)
   2nd Coat: S-W Duration® Exterior Latex Acrylic Gloss Coating, K34 Series (7 mils wet, 2.8 mils dry per coat)
2. Steel Shop Primed (structural steel framing exposed to view including steel lintels and steel stairs and handrails)
   1st Coat: S-W ProCryl® Universal Primer, B66-310 Series (2-4 mils dry)
   2nd Coat: S-W Centurion® Water Based Urethane, B65-700 Series
   3rd Coat: S-W Centurion® Water Based Urethane, B65-700 Series (2-3 mils dry per coat)

C. Interior Paint Systems are as follows:

1. Gypsum Drywall (Semi-Gloss)
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
   2nd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series
   3rd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series (4 mils wet, 1.6 mils dry per coat)
2. Gypsum Drywall (Eggshell)
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
   2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
   3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.6 mils dry per coat)
3. Gypsum Drywall (in wet areas)
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
   2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25
   3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (2.5 - 3 mils dry per coat)
4. Gypsum Drywall (under vinyl wall covering)
   1st Coat S-W PrepRite® PreWallcoving Primer, B28W980 (4 mils wet, 1.2 mils dry)
5. Ferrous and Zinc Coated Metal (Common applications)
   1st Coat: S-W ProCryl Universal Primer, B66-310 Series

2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series
3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series
(4 mils wet, 1.4 mils dry per coat)

6. Ferrous and Zinc Coated Metal: (Chemical & Salt Storage applications)
   1st Coat: S-W ProCryl® Universal Primer, B66-310 Series
   (2-4 mils dry)
   2nd Coat: S-W Centurion® Water Based Urethane, B65-700 Series
   3rd Coat: S-W Centurion® Water Based Urethane, B65-700 Series
   (2-3 mils dry per coat)
7. Exposed Structural Steel and Roof Deck (shop primed steel)
   1st Coat: S-W ProCryl Universal Primer, B66-310 Series - Spot Prime if needed
   (2-4 mils dry)
   2nd Coat: S-W Waterborne Acrylic Dry Fall, B42W2
   3rd Coat: S-W Waterborne Acrylic Dry Fall, B42W2
8. Painted Woodwork (Common applications)
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900
   (4 mils wet, 1.3 mils dry per coat)
   2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series
   3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series
   (4 mils wet, 1.4 mils dry per coat)
9. Painted Woodwork: (Chemical & Salt storage applications)
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900
   (4 mils wet, 1.3 mils dry per coat)
   2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25
   3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25
   (2.5 - 3 mils dry per coat)
10. Stained Woodwork
   1st Coat: S-W Minwax 250 VOC Stains
   2nd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series
   3rd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series
   (4 mils wet, 1.0 mil dry per coat)
11. Concrete Floor Sealer (Clear)
   1st Coat H&C Concrete Sealer Solid Color Solvent Based - Clear
   2nd Coat H&C Concrete Sealer Solid Color Solvent Based - Clear
   Include Optional - H&C SharkGrip Slip Resistant Additive to the 2nd coat. Note - New concrete must be etched prior to application, comply with manufacturer's written instructions.
12. Interior Concrete Stairs (New Construction)
   1st Coat H&C Concrete Sealer Solid Color Solvent Based
   2nd Coat H&C Concrete Sealer Solid Color Solvent Based
   Include Optional - H&C SharkGrip Slip Resistant Additive to the 2nd coat. Note - New concrete must be etched prior to application, comply with manufacturer's written instructions.
13. Concrete Containment Pit (Interior surfaces-Floor & Walls
   1st Coat S-W EPO-PHEN™FF Tank Lining Part A & Part B, B62 Series
   2nd Coat S-W EPO-PHEN™FF Tank Lining Part A & Part B, B62 Series
   (10 mils wet, 7.0 mils dry per coat)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Applicator must examine the areas and conditions under which painting Work is to be applied and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory

conditions have been corrected in a manner acceptable to the Applicator. Starting of painting Work will be construed as the Applicator's acceptance of the surfaces and conditions within any particular area.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 SURFACE PREPARATION

A. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition. Remove all 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 the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, re-install the removed items by workmen skilled in the trades involved. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule the cleaning and painting so that contaminates from the cleaning process with not fall onto wet, newly painted surfaces.

B. Ferrous Metals:

1. 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.
2. Touch-up shop-applied prime coats wherever damaged or bare. Where required by other Sections of these Specifications, clean and touch-up with the same type shop primer.

C. Galvanized Surfaces: Clean free of oil and surface contaminants with acceptable non-petroleum based solvent.

D. Wood: Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, 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 the priming coat.

1. Prime, stain, or seal wood required being job-painted, as soon as practicable upon delivery to job. Prime edges, ends, faces, under sides, and backsides of such wood, including cabinets, counters, cases, paneling, etc. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dry.
2. When transparent finish is required, use sealer as recommended by manufacturer. Seal tops, bottoms, and cutouts of unprimed wood doors with sealer immediately upon delivery to project.

3.03 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.04 APPLICATION

A. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the substrate and type of material being applied. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

B. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint. Paint the back- sides of access panels, and removable or hinged covers to match the exposed surfaces.

C. Finish exterior doors on tops, bottoms and side edges the same as the exterior faces, unless otherwise indicated.

D. Sand lightly between each succeeding enamel or varnish coat.

E. Omit the first coat (primer) on metal surfaces that have been shop-primed and touch-up painted, unless otherwise indicated or barrier coat is required for compatibility.

F. Scheduling Painting: Apply the 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. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

G. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

H. Mechanical and Electrical Work: Painting of mechanical and electrical Work include items exposed to view in mechanical equipment rooms, in occupied spaces and where indicated on Drawings or specified in other Sections. Coordinate with Plumbing, HVAC and Electrical Sections.

1. Mechanical items to be painted include, but are not limited to, the following:
   a. Piping, pipe hangers, and supports.
   b. Heat exchangers.
   c. Tanks.
   d. Ductwork.
   e. Motor, mechanical equipment and supports.
   f. Accessory items.
2. Electrical items to be painted include, but are not limited to, the following;
   a. Conduit and fittings.
   b. Switchgear.

I. Prime Coats: Apply a prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Re-coat 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.

J. 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, or other surface imperfections will not be acceptable.

K. 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. Provide satin finish for final coats, unless otherwise indicated.

L. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint Work not in compliance with specified requirements.

3.05 CLEANING AND PROTECTION

A. Cleaning: During the progress of the Work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each workday. 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.

B. Protection: Protect Work of other trades, whether to be painted or not, against damage by painting and finishing Work. Correct any damage by others for protection of their Work, after completion of painting operations. At the completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 10 11 00 VISUAL DISPLAY SURFACES

PART 1- GENERAL

1.01 SECTION INCLUDES

A. Visual display boards as described in this section. Types specified in this section include Tackboard, and Markerboard.

1.02 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Submit manufacturer's technical data and installation instructions for each material and component parts, including data substantiating materials comply with requirements.

B. Samples: Submit full range of color samples for each type of visual display board, surface, trim and accessories required. Provide 12-inch square samples of sheet materials and 12-inch lengths of trim members for color verification after selections have been made.

C. Shop Drawings: Submit for each type of visual display board. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.

D. Certification: Submit manufacturer's certification that all materials furnished for Project complies with requirements specified herein.

1.04 QUALITY ASSURANCE

A. Unless otherwise acceptable to Project Engineer / MDOT Architect, furnish all visual display boards by one manufacturer for entire project.

B. Fire Hazard Classification: Provide tackboard surfaces which have been tested in accordance with ASTM E-84 and have been certified as complying with the following fire hazard classifications: Flame spread, fuel contributed and Smoke developed not more than 25.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Claridge Products and Equipment, Inc., P.O. Box 910, Harrison, AR 72602. Tel. (870) 743-2200.

B. Equivalent products by the following manufacturers are acceptable:

1. Draper, Inc., P.O. Box 425, Spiceland, IN 47385. Tel. (765) 987-7999.
2. March Industries, Inc., P.O. Box 509, Dover, OH 44622. Tel. (330) 343-8825.
3. NACO, 180 N. Sherman Ave., Corona, CA 91720. Tel. (909) 340-2800.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 MATERIALS

A. Tackboard: Equal to Claridge Series # 1 type “CO” factory framed tackboard. Tackboard is Claridge 1/4-inch Cork on 1/4 inch Hardboard, color as selected by Project Engineer / MDOT Architect from manufacturer’s standards. Size, 4 feet by 6 feet. Quantity required as indicated on the Drawings.

B. Marker Board: Equal to Claridge Series #LCS-2000-R type “A” factory built marker board with jamb trim, and chalk trough with end closures. LCS 3 coat porcelain enamel liquid chalk surface on Duracore with 0.002 aluminum foil back approx. 1/2 inch thick overall. Extruded aluminum trim to have anodized satin finish. Include standard eraser and assorted LCS markers. Size to be 4 feet by 8 feet. One unit required unless additional units are indicated on the Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine areas and conditions under which units are to be installed 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 manner acceptable to Installer.

3.02 INSTALLATION

A. Deliver factory-built units completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of length as acceptable to Project Engineer / MDOT Architect. When overall dimensions require delivery in separate units, pre-fit at factory, disassemble for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.

B. Install units in locations and mounting heights as shown on Drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb, and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories for complete installation. If units are not shown on Drawings, install units in locations as directed by Project Engineer.

C. Coordinate job-assembled units with grounds, trim, and accessories. Join all parts with neat, precision fit.

3.03 CLEANING

A. Verify accessories required for units are properly installed.

B. Clean units in accordance with manufacturer's instructions, breaking in only as recommended.

END OF SECTION

SECTION 10 14 00 SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Signage for room identification system, informational and directional signage, and exterior individual building signage and free standing, ground mounted sign.

1.02 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Submit manufacturer's technical data and installation instructions for each type of sign required.

B. Samples: Submit samples of each color and finish of exposed materials and accessories required for specialty signs. Project Engineer / MDOT Architect's review of samples will be for color and texture only. When requested, furnish full-size samples of specialty sign materials.

a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual selections of material including the full range of colors available for each material required.

b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate showing the full range of colors available.

C. Shop Drawings: Submit Shop Drawings for fabrication and erection of specialty signs. Include plans, elevations, and large-scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.04 QUALITY ASSURANCE

A. Provide each type of sign as a complete unit produced by a single manufacturer including necessary mounting accessories, fittings and fastenings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver components correctly packed to prevent damage. Store in secure area out of weather. Handle per manufacturer's instructions.

1.06 WARRANTY

A. Provide manufacturer's standard one-year warranty covering manufacturing defects.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by ASI Sign Systems, Inc., 3890 W. NW Hwy, Suite 102, Dallas, TX 75220. Tel. (800) 274-7732.

B. Equivalent products by the following manufacturers are acceptable:

1. Matthews International Corp., Pittsburgh, PA. Tel. (800) 628-8439.
2. Metal Arts, Mandan, ND. Tel. (701) 663-6535.
3. Mohawk Sign Systems, Inc., Schenectady, NY. Tel. (518) 370-3433.
4. Scott Sign Systems, Inc., Sarasota, FL. Tel. (800) 237-9447.

C. Manufacturers of Dimensional Letters and Numbers:
1. A.R.K. Ramos Manufacturing Company, Inc.
2. ASI Sign Systems, Inc., 3890 W. NW Hwy, Suite 102, Dallas, TX 75220. Tel. (800) 274-7732.
3. Matthews International Corp., Pittsburgh, PA. Tel. (800) 628-8439.
4. Metal Arts, Mandan, ND. Tel. (701) 663-6535.
5. Metallic Arts, Inc.

D. Substitutions shall fully comply with specified requirements and Section 0 162 14-Product Options and Substitution Procedures

2.02 SIGN SYSTEM

A. Interior signage: Wall or desktop mounted WS Series with rounded corners. Design so that paper insert can be installed from each end.

2.03 COMPONENTS – EXTERIOR SIGNAGE

A. Material: Cast aluminum, projected mount with sleeve and stud.

B. Finish: Baked-Enamel Finish. Color as selected by architect from full range of colors.

2.04 COMPONENTS – INTERIOR SIGNAGE

A. Window Inserts: Laser printed paper insert with MDOT watermark. Text to be furnished by Owner.

B. Sign Face: Clear Acrylic, 0.080-inch thick, matte first surface.

C. Adhesive: Pressure sensitive, adhesive film on second surface.

D. Insert Guide Rails: 0.040-inch thick vinyl tape.

E. Tactile Laminate: Polyamid Resin.

F. Laminating Base: Acrylic, 0.080-inch thick.

G. Fasteners: 0.030- inch thick, double-face tape.

H. Stand: Clear Acrylic, 0.080-inch thick.

I. Sizes as follows:

1. Type 1: 10 inches wide by 3 inches high.
2. Type 2: 6 inches wide by 9 inches high.
3. Type 3: 9 inches wide by 8 inches high.
4. Type 4: 10 inches wide by 3 inches high.

2.05 BRAILLE AND TACTILE COPY

A. Comply with requirements of the Americans with Disabilities Act. Tactile copy to be raised 1/32-inch minimum from sign first surface by manufacturer's photomechanical stratification processes. Translation of copy into Braille shall be the responsibility of the manufacturer.

2.06 FINISHES – INTERIOR SIGNAGE

A. Colors: Selected from manufacturer's standard.

B. Surface Texture: Matte.

2.07 FONT

A. Shall be Helvetica Medium, unless noted otherwise.

2.08 DIMENSIONAL LETTERS AND NUMBERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

1. Metal: Aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION: Installer shall examine the substrates and conditions under which the specialty signs are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION

A. Install sign units and components at the locations shown or scheduled, securely mounted with concealed theft-resistant fasteners, unless otherwise indicated. Attach signs to substrates in accordance with the manufacturer's instructions, unless otherwise shown.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Project Engineer.

C. Position sign on wall surface 2 inches from strike side of doorframe and 60 inches high to center of sign from finish floor, typical unless indicated otherwise.

D. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

3.03 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.04 SCHEDULES

A. Sign Type 1: Offices, single occupant
Conference / Break
Storage
Mechanical

B. Sign Type 2: Toilets

C. Sign Type 3: Offices, multiple occupants

D. Sign Type 4: Office (Desktop at Secretary / Receptionists)

E. Building Letters:

1. Flat – Letter style to be determined by Architect/Owner from all styles available.
2. 18" high, 61 Letters:
   MISSISSIPPI DEPARTMENT OF TRANSPORTATION
   MATERIALS AND RESEARCH SHOP
3. 18" high, 56 Letters:
   MISSISSIPPI DEPARTMENT OF TRANSPORTATION
   MATERIALS LABORATORY

END OF SECTION

SECTION 10 21 14 REINFORCED COMPOSITE TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Solid color reinforced composite, floor-mounted, overhead braced, toilet compartments and wall-hung urinal screens.

1.02 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's sample warranty, color charts and detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit job-specific shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other Work.

1.04 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication where possible, to ensure proper fitting of Work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.

B. Coordination: Furnish inserts and anchorage, which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.05 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of toilet partitions and other materials, installer shall examine the shipment for damage and completeness. Materials shall be stored in a clean, dry place. Stack all materials to prevent damage.

1.06 WARRANTY

A. Manufacturer to supply a written warranty covering all plastic components against breakage, warping, corrosion and delamination for a period of 10 years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on product model 1092.67 SierraSeries as manufactured by Bobrick Washroom Equipment, Inc., 100 Bobrick Drive, Jackson, TN. 38301-5635. Tel. (731) 424-7000.

B. Equivalent products by the following manufacturers are acceptable:

1. Privacy Plus™ Toilet Compartments by Gerali Custom Design, Inc.
2. Ultimate Corian® System by Shower Shapes.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 COMPONENTS/MATERIALS

A. Stiles, Panels, Doors, and Screens shall be all be manufactured from Solid Color Reinforced Composite material.

B. Characteristics: Toilet partition materials shall be constructed of Solid Color Reinforced Composite material, which is composed of dyes, organic fibrous material, and polycarbonate/phenolic resins. Material shall have a non-ghosting, graffiti resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure. Edges of material shall be the same color as the surface.

1. Stiles, doors, and urinal screens shall be a minimum of 3/4 inch thick, panels shall be a minimum of 1/2 inch thick and all exposed surfaces to be free of saw marks.
2. Doors and dividing panels shall be 55 inches high and mounted 14 inches above the finish floor.
3. Pilasters shall be full height and fastened into a 3-inch high stainless steel pilaster shoe with a stainless steel, torx head sex bolt.
4. Urinal screens shall be 24 inches wide X 42 inches high with 41 inch continuous aluminum wall brackets.
5. Finish shall be similar and equal to standard color chart selections from Bobrick. Color of doors and pilasters to be selected by the Project Engineer / MDOT Architect from Manufacturer's full color range.

2.03 HARDWARE

A. Door hardware: Vandal-Resistance door hardware shall be as follows:

1. All hardware shall be 18-8, type-304 stainless steel with satin finish.
2. Hinges shall be manufacturer's 16-gage self-closing piano hinge continuous for door height.
3. Each door shall be supplied with one coat bumper / hook.
4. Each handicapped door to include one door pull and one wall stop.
5. Door stops shall be fabricated from stainless steel and shall be vandal-resistance.
6. Door latch shall be fabricated from heavy-duty 14-gage, type 304 stainless steel and include through-bolted keeper.

B. Wall Brackets: Wall brackets shall be full-length continuous stainless steel. Brackets shall be used for all pilasters to pilaster and pilasters to wall connections. Attach brackets to adjacent wall construction with No. 14 by 1-1/2 inch stainless steel Phillips head screws. Anchor screws directly behind the vertical edge of pilasters at 12-inch intervals

along the full length of bracket and at each 12-inch interval alternately spaced between anchor connections.

C. Accessories: Furnish units with chromium-plated finish, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine the areas and conditions under which toilet partitions and related items are to be installed, including supporting anchors and supports installed by others, and must notify Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in manner acceptable to the Installer.

3.02 INSTALLATION

A. Comply with manufacturer's recommended procedure and installation sequence. Install partitions rigid, straight, plumb, and level. Secure partitions in position with manufacturer's recommended anchoring devices. Provide clearances of not more than 1/2 inch between pilasters and panels, and not more than one inch between panels and walls. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 1/4 inch.

3.03 ADJUSTING AND CLEANING

A. Adjusting: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.

B. Cleaning: 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 10 21 16 SHOWER AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Shower compartments fabricated from solid polymer.
2. Dressing compartments fabricated from solid polymer.
3. Shower receptors.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
2. Section 06 10 00 "Rough Carpentry" for blocking.
3. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for grab bars, purse shelves, and similar accessories.
4. Section 22 41 00 "Residential Plumbing Fixtures" for shower heads, valves, and controls.
5. Section 09 05 15 – “Color Design”.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit job specific shop drawings for fabrication and erection of shower compartment assemblies not fully described by drawings, templates, and instructions for installation of anchorage devices built into other work.

1. Show locations of cutouts for compartment-mounted accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of drains.
4. Show overhead support or bracing locations.

C. Samples for Initial Selection: For each type of compartment indicated. Include Samples of hardware and accessories for material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for compartments, prepared on 6-inch-(152-mm-) square Samples of same thickness and material indicated for the Work.
2. Each type of hardware and accessory.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of shower and dressing compartment, from manufacturer.

1.05 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting or work. However, allow for adjustments with specified tolerances wherever taking of field measurements before fabrication might delay work.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for shower and dressing compartments designated as accessible.

C. Coordination: Furnish inserts and anchorage, which must be built into other work for installation of shower compartments and related work; coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

B. Stainless-Steel Castings: ASTM A 743/A 743M.

C. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Pilaster Shoes and Sleeves (Caps): Formed from stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

2.02 SOLID-POLYMER COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment or comparable product by one of the following:

1. Privacy Plus Shower compartments, by Gerali Custom Design, LLC.

2. Ultimate Corian System by Shoner Shapes.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14 product options and substitutions procedures. .

C. Configuration: Shower and dressing compartments as shown on Drawings.

D. Enclosure Style: Floor and ceiling anchored

E. Panel and Pilaster Construction: Solid HDPE panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard, continuous, stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
3. Color and Pattern: One color and pattern in each room; as selected by Architect from manufacturer's full range to match solid-polymer toilet compartments specified in Section 102113 "Toilet Compartments".

F. Door Construction: Match panels.

G. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.

1. Polymer Color and Pattern: Match solid-polymer toilet compartments specified in Section 102113 "Toilet Compartments".

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

a. Polymer Color and Pattern: Match solid-polymer toilet compartments specified in Section 102113 "Toilet Compartments".

2. Stirrup Type: Ear or U-brackets; stainless steel.
3. Dressing-Compartment Brackets: Match toilet-compartment brackets specified in Section 102113 "Toilet Compartments."

2.03 ACCESSORIES

A. Soap Holder: Surface-mounted, seamless stainless-steel soap dish.

B. Seats: Manufacturer's standard, wall-mounted benches.

1. Material: Solid phenolic.
2. Operation: Fixed.
3. Finish: Match enclosure panels.

C. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, or solid brass, finished to match the items they are securing; with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel.

2.04 FABRICATION

A. Floor-and-Ceiling-Anchored Compartments: Provide manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine the areas and conditions under which toilet partitions and related items are to installed, including supporting anchors and supports installed by others, and must notify Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in manner acceptable to the installer.

3.02 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices. Provide clearances of not more than ½ inch between pilasters and panels, and not more than one inch between panels and walls.

B. Floor-and-Ceiling-Anchored Compartments: Secure pilasters to supporting construction, and level, plumb, and tighten.

C. Shower Receptors: Install prefabricated shower receptors with drain gasket compression fit to outside diameter of waste pipe.

3.03 ADJUSTING AND CLEANING

A. Cleaning: Clean exposed surfaces of shower compartment 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 10 22 14 CHAIN LINK PARTITIONS AND GATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chain link partitions, framing and gates. The Work includes, but is not limited to, posts, framing, chain link fabric, tie wire, tension wire, hardware and miscellaneous framing & supports.

1.02 SUBMITTALS

A. Submit shop drawings for all items. Indicate profiles, sizes, materials connection details, attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, with plans, elevations, and details where applicable.

B. Submit manufacturer's or fabricator's test results and other data certifying that all materials furnished for construction of chain link partitions comply with the requirements of the Drawings and Specifications. The Owner reserves the right to retest all materials.

1.03 REFERENCES

A. ASTM - American Society for Testing and Materials:

1. ASTM A123 – Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A392 – Zinc-Coated Steel Chain-Link Fence Fabric.
4. ASTM F567 – Standard Practice for Installation of Chain-Link Fence.
5. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
6. ASTM F1345 – Standard Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

B. NPS – National Pipe Standards

C. CLFMI Product Manual – Chain Link Fence Manufacturers Institute

D. AASHTO – American Association of State Highway Transportation Officials

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Master-Halco, Anchor Fence Division, Edgewood, MD. Tel. (800) 229-5615.
2. Southwestern Wire, Inc., Norman, OK. Tel. (800) 348-9473.
3. AMICO (Alabama Metal Industries Corp.), Birmingham, AL. Tel. (800) 366-2642.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 CHAIN LINK FABRIC

A. Provide chain link fabric for partitions and gates in configurations as shown on the Drawings and conforming with the following:

1. Gauge: 9
2. Mesh Size: 2" square
3. Height: As required by Drawings
4. Coating: Class C spelter coating

Privacy Slats: Provide manufacturer's standard slats in fence partitions as indicated on drawings.

2.03 FRAMING

A. All metal posts shall be of the size, configuration and minimum weight per foot as specified herein and as shown on the Drawings. Round steel posts shall be galvanized steel pipe, coated inside and out, and shall comply with ASTM F 1083, Schedule 40.

2.04 FRAMING (OPTION)

A. Round steel posts meeting the following specifications will be acceptable alternates to those meeting the requirements of ASTM F 1083, Schedule 40.

B. The pipe shall be manufactured by cold rolling electric resistance welding of high strength steel having a minimum yield strength of 50,000 psi conforming to ASTM A 446 or A 569. The exterior surface of the pipe shall be triple coated with hot-dip galvanized zinc followed by a chromate conversion coating and urethane or polyurethane acrylic top coating. The interior surface of the pipe shall be given corrosion protection by zinc rich organic coating or hot-dipped galvanized zinc coating.

C. The pipe shall meet the following requirements for wall thickness and weight per linear foot:

Nominal Pipe Size (I.D. Inches)	Minimum Wall Thickness (Inches)	Minimum Wt. / Ft. (Lbs.)
1-1/4	0.110	1.820
1-1/2	0.120	2.281
2	0.130	3.117
2-1/2	0.160	4.640

D. The strength of the pipe shall be the product of the yield strength and the section modulus, and shall not be less than that of pipe equivalent diameter conforming to ASTM F 1083, Schedule 40.

E. The protective coatings shall conform to the requirements of AASHO M 181 for grade 2 posts and rails with hot-dip galvanized zinc plus organic exterior coatings.

2.05 FABRIC FILLED GATES

A. The gate frame shall be constructed from pipe complying with ASTM F 1083, Schedule 40 and to the design and dimensions as shown on the Drawings. All connections shall be welded and watertight. The entire frame shall be hot dip galvanized after welding.

2.06 TENSION WIRE

A. Tension wire shall be of the same material as the partition wire being used, shall be of good commercial quality, and shall meet the following requirements:

B. The base metal of zinc coated tension wire shall be steel wire having a minimum tensile strength of 60,000 psi.

C. Spelter coating shall comply with AASHTO M 279, Class 1.

2.07 TIE WIRE

A. Tie wire shall be of good commercial quality zinc coated steel of the size and spacing as shown on the Drawings. Spelter coating shall comply with AASHTO M 279, Class 1.

2.08 HARDWARE

A. Provide industrial duty steel, malleable iron or ductile iron hardware galvanized in accordance with ASTM A153. Provide hinges, drop rods and hold-open fittings at all gates. Provide with heavy-duty cantilever latch with padlock equal to Schlage 45-101. Provide anchors, sleeves and all required fasteners to secure the Work.

2.09 CONCRETE FOR ANCHORS AND FOOTINGS

A. Concrete for anchors and footings shall conform to requirements of Section 03 30 00 Cast-in-Place Concrete.

B. Foundation Tube Sleeve: AASHTO M-36, corrugated 16-gage steel, galvanized, depth as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Perform cutting, drilling and fitting required for installation; set Work accurately in location, alignment and elevation measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other Work.

B. The bottom of partitions shall not be more than one inch from the surface of finished floor slab.

C. Attachment: Wire shall be stretched taut and firmly attached to posts and braces by methods and spacing as indicated. All wire shall be installed to the required elevation.

3.02 PARTITION POSTS

A. Install foundation tube and posts in accordance with manufacturer’s instructions.

3.03 GATE FRAMES

A. Provide gates and frames constructed of round tubular members continuously welded at all corners and intersections. Install gates plumb, level and secure for full opening without interference. Hang swing gates in hinges so they will remain motionless in any position.

END OF SECTION

SECTION 10 26 13 CORNER GUARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vinyl / Acrylic surfaced mounted Corner Guards.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for corner guards.

B. Samples: Submit samples of material finishes, profiles and colors for corner guards.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Arden Architectural Specialties, Inc., Saint Paul, MN. Tel. (651) 631-1607.
2. Construction Specialties, Inc., Muncy, PA. Tel. (570) 546-5941.
3. Koroseal Wall Protection Systems, Inc. Fairlawn, OH. Tel. (330) 668-7600.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures

2.02 CORNER GUARDS

A. Corner guards shall be installed full height, unless height indicated otherwise on the Drawings, at all outside corners in corridors and elsewhere as shown on the Drawings.

1. Corner guards shall be equal to C/S Model SSM-20 series surface mounted corner guards with optional full height aluminum retainers, vinyl covers and matching top and bottom end caps.
2. Color to be selected by Project Engineer / MDOT Architect from full range of standard colors. Refer to Section 09 05 15 for color(s).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units plumb and level, in locations as shown or described. Securely attach to supporting structure, in accordance with manufacturer's installation instructions.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 10 28 13 TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The extent of each type of toilet accessory is shown on the Drawings and Schedules, unless otherwise indicated. The types of toilet accessories required include the following:

1. Mirrors
2. Toilet Paper Dispenser
3. Grab Bars
4. Soap Dispensers
5. Paper Towel Dispenser
6. Clothes Hook
7. Mop Holder
8. Under lavatory Guards (required where hot water line is exposed).

1.02 SUBMITTALS

A. Submit manufacturer's product and technical data indicating compliance with these specifications and Shop Drawings for the fabrication and installation of all toilet accessories. Show all anchorage and other necessary items including mounting heights.

1.03 QUALITY ASSURANCE

A. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, unless otherwise acceptable to the MDOT Architect. Stamped names or labels on exposed faces of units will not be permitted, except where otherwise indicated.

1.04 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of toilet accessories and other materials, installer shall examine the shipment for damage and completeness. Materials shall be stored in a clean, dry place. Stack all materials to prevent damage.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Bradley Washroom Accessories Division, P.O. Box 309, Menomonee Falls, WI 53051. Tel. (414) 354-0100.

B. Equivalent products by the following manufacturers are acceptable:

1. A & J Washroom Accessories, New Windsor, NY. Tel. (845) 562-3332.
2. Bobrick Washroom Equipment, Inc., Jackson, TN. Tel. (731) 424-7000.
3. Plumberex Specialty Prod., Inc. Palm Springs, CA (800) 475-8629; (760) 343-7363.
4. TCI Products. Hillsboro, OR (866) 533-4273; (503) 533-9223.
5. Truebro, Inc. Ellington, CT (800) 340-5969; (860) 875-2868.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 ACCESSORIES

A. Mirrors: Provide 1/4 inch polished plate glass, electrolytically plated mirrors with 1/2 inch stainless steel channel frame. Mirrors shall be 24 inches by 36 inches equal to Bradley model 780-2436. Locate at each toilet lavatory mounted in locations shown.

B. Toilet Paper Dispenser: Provide surface mounted stainless steel multi-roll toilet tissue dispenser equal to Bradley model 5402. Locate at each toilet mounted in locations shown.

C. Grab Bars: Provide 1-1/2 inches diameter horizontal 2 wall stainless steel grab bars with safety-grip non-slip finish and concealed mounting equal to Bradley model 8122-059, 36 inches by 52 inches standard dimensions.

1. Locate at toilets where indicated at heights shown. Contractor has option to use one 36-inch horizontal grab bar and one 42-inch horizontal grab bar and one 18" grab bar, but installation must meet all ADA requirements.
2. Locate at shower where indicates at height shown. Horizontal grab bars shall be provided across the control wall and on the back wall to point 18 inches from control wall. A vertical grab bar 18 inches minimum in length shall be provided on the control end wall 3 inches minimum to 6" maximum above the horizontal grab bar and 4 inches maximum inward from the front edge of the shower.

D. Soap Dispensers: Provide surface mounted liquid type stainless steel soap dispenser units equal to Bradley model 6542(Horizontal) or 6562 (Vertical) as indicated on the Drawings. Locate at each lavatory at heights shown.

E. Paper Towel Dispenser: Provide surface mounted stainless steel paper towel dispensers equal to Bradley model 250-15. Locate at each area with lavatory/sink where shown and at height shown.

F. Clothes Hook: Provide surface mounted stainless steel hook equal to Bradley model 9135 at each Toilet Room, unless coat hooks are provided with toilet partition doors.

G. Mop Holder: Provide surfaced mounted stainless steel mop and broom holder equal to Bradley model 9933. One piece construction with welded gusset and hooks. Holder consists of spring activated rubber cams on plated steel retainers. Unit measures 14 inches high by 34 inches long, with 4 hooks and 3 holders. Shelf projects 8 inches. Locate at each service sink where shown and at height shown or if not shown then per the Project Engineer's instructions.

H. Folding Shower Seat: Provide folding barrier free shower seat equal to Bradley 956-30, stainless steel. Provide one per plans.

I. Shower Curtain Rod: Provide surface mounted stainless steel shower curtain rod equal to Bradley model 9531, 1-1/4" diameter tubing constructed of seamless 18 gauge stainless steel, satin finish with flanges of one piece construction in 22 gauge stainless steel. Provide in one piece lengths. For 72" lengths and greater, model 9522 shower rod ceiling support is required.

J. Shower Curtain Hooks: Provide shower curtain hooks equal to Bradley model 9540, quantity of 18 per shower rod.

K. Shower Curtains: Provide shower curtain equal to Bradley 9537, shower curtain in 10 oz. nylon reinforced antimicrobial PVC vinyl fabric (flameproofed, stain-resistant, self-deodorizing) and furnished with aluminum grommets on 6” centers. Shower curtain is 0.014” thick and all sides are hemmed. Provide 72” wide x 72” high shower curtains per plan, minimum of 8.

L. Under lavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded-plastic, white

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine the areas and conditions under which toilet accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION

A. Use concealed fastenings wherever possible. Provide anchors, bolts, blocking in wall and other necessary anchorage, and attach accessories securely to walls and partitions in locations as shown or directed. Install concealed mounting devices and fasteners fabricated of the same material as the accessories, or of galvanized steel, as recommended by manufacturer.

B. Install exposed mounting devices and fasteners finished to match the accessories. Provide theft-resistant fasteners for all accessory mountings. Secure toilet room accessories in accordance with the manufacturer's instructions for each item and each type of substrate construction. Blocking for all toilet accessories, specifically for grab bars and barrier free shower seat, to be verified on site by architect or photographically prior to concealment behind wall construction.

C. Installation shall meet all ADA requirements including proper mounting heights.

END OF SECTION

SECTION 10 43 15 DEFIBRILLATORS AND CABINETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Automated External Defibrillator, including cabinets, accessories and mounting brackets.

1.02 SUBMITTALS

A. Submit manufacturer's technical data and installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured / distributed by J.L. Industries, Inc., 4450 W. 78th Street Circle, Bloomington, MN 55435. Tel. (612) 835-6850.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 AUTOMATED EXTERNAL DEFIBRILLATOR

A. Defibrillator: Provide Defibrillator for location(s) as indicated on the Drawings, equal to Medtronic LIFEPAK® CR “plus”.

B Cabinets: Provide cabinet(s) equal to J.L. Industries stainless steel recessed type cabinet complying with ADA requirements. Provide Fire-FX option where located in a fire rated wall. Cabinet shall accommodate the Medtronic LIFEPAK® CR “plus” Defibrillator. Provide complete unit(s) with Commander Alarm and Saf-T-Lok™ options.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

C. Defibrillator unit(s) shall be mounted in exposed locations as indicated on the Drawings, or if not indicated, as directed by the Architect. A minimum of one unit is required.

D. Check all cabinets for scratched, nicked, and other surface defects. Cabinets with these conditions shall be repaired or replaced.

3.02 CLEANING AND PROTECTION: At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 10 44 16 FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Portable, multi-purpose, and dry-chemical fire extinguishers including accessories and mounting brackets.

1.02 SUBMITTALS

A. Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required.

1.03 QUALITY ASSURANCE

A. Provide new portable fire extinguishers which are UL listed and bear UL "Listing Mark" for each type, rating, and classification of extinguisher indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by J.L. Industries, Inc., 4450 W. 78th Street Circle, Bloomington, MN 55435. Tel. (612) 835-6850.

B. Equivalent products by the following manufacturers are acceptable:

1. Amerex Corp., Trussville, AL. Tel.(205) 655-3271.
2. Larsen's Mfg. Co., Minneapolis, MN. Tel. (612) 571-1181
3. Potter-Roemer, Santa Ana, CA. Tel. (800) 366-3473.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 FIRE EXTINGUISHERS

A. Provide fire extinguishers for each location indicated, in colors and finishes that comply with requirements of governing authorities.

B. Multi-Purpose Dry Chemical for Wall Mounting: Equal to J.L. Industries Cosmic 10E, UL rated 4A-60BC, 10 lb. nominal capacity.

2.03 MOUNTING BRACKETS

A. Provide manufacturer's bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

2.04 FIRE-PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.
   a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch-(16-mm-) thick, fire-barrier material.
   b. Provide factory-drilled mounting holes.
2. Cabinet Metal: Enameled-steel sheet.

B. Cabinet Type: Suitable for the following:
   1. Fire extinguisher.

C. Cabinet Mounting: Suitable for the following mounting conditions:
   1. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

E. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.

F. Cabinet Trim Material: Manufacturer's standard, as follows:
   1. Steel sheet.

G. Door Material: Manufacturer's standard, as follows:
   1. Steel sheet.

H. Door Glazing: Manufacturer's standard, as follows:
   1. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:
      a. Class 1 (clear).

I. Door Style: Manufacturer's standard design, as follows:
   1. Fully glazed panel overlapping frame.

J. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
   1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.

K. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.05 ACCESSORIES

A. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
   1. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
      a. Application Process: Silk-screened.

2.06 COLORS AND TEXTURES

A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.07 FINISHES, GENERAL

A Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
   1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
   2. Interior of cabinets and doors.

E. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
   1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
   2. Color: As selected by Architect from manufacturer's full range.

2.08 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

   1. Color and Gloss: As selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights and locations to comply with applicable regulations of governing authorities.

B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

C. Fire Extinguisher units shall be mounted in exposed locations indicated, or if not indicated, in a manner such that no point in the building will be further than 75 feet from an extinguisher. A minimum of four units are required if not indicated otherwise.

END OF SECTION

SECTION 10 51 13 METAL LOCKERS AND BENCH

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Locker units with hinged doors, metal bases, tops, filler panels, closed bases, finished end panels, accessories and hardware.

1.02 REFERENCES

A. ANSI/ASTM A446 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

B. ANSI/ASTM A526 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's installation instructions and product data on locker types, sizes and accessories.

B. Shop Drawings: Submit shop drawings indicating locker plan layout, numbering plan, key codes, sizes and configurations.

C. Color Selection: Provide samples of materials, texture, color and finishes available for Project Engineer / MDOT Architect's selection.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Penco Products, Inc., 99 Brower Ave, Oaks, PA 19456. Tel. (800) 562-1000.

B. Equivalent products by the following manufacturers are acceptable:

1. Art Metal Products, Deerfield, FL. Tel. (800) 252-5633.
2. Lyon Metal Products, Aurora, IL. Tel. (800) 323-0082.
3. Republic Storage System Co, Inc., Canton, OH. Tel. (800) 477-1255.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 SELECTED LOCKER UNIT

A. Vanguard Model 6175V Single Tier Locker with standard louvered doors. Size: 72 inches overall height by 15 inches width by 21 inches depth. Provide closed bases and finished end panels. Twenty-Three units are required, unless additional units are indicated otherwise on the Drawings.

2.03 MATERIALS

A. All parts shall be made from prime grade mild cold rolled sheet steel free from surface imperfection, and capable of taking a high grade enamel finish.

2.04 ACCESSORIES

A. Each locker tier shall have chrome plated zinc alloy die-cast case and door handle, door latch channel assembly, polished aluminum number plate (2-1/4 inches wide x 1 inch high with 3/8 inch high black etched numerals), hat shelf approximately 9 inches below top of locker and coat rod.

B. Continuous slope top hood with slope top fillers fit on top of flat locker tops. All hoods are to be cut to length during installation, intermediate splices, ends, rear supports required to complete installation.

C. Vertical fillers to fill gaps and provide continuous row appearance are required.

2.05 FINISHES

A. Chemically pretreat metal with a six stage cleaning phosphatizing and metal preparation process. Finish coat shall be hot airless electrostatically applied baked on enamel.

B. Paint lockers in color as selected by the Project Engineer / MDOT Architect from manufacturer's standard range of 17 colors. Refer to Section 09 05 15-Color Design.

2.06 BENCH UNIT

A. Provide bench, fixed in place of 9 ½" deep x 1 ¼" thick hardwood top. Finished with clear lacquer. Pedestal bases to be 16 ¼" high, tubular steel with welded top and bottom flanges. Pedestals must be anchored to floor. Bench to be 6'0" long.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install metal lockers at location show on Drawings in accordance with manufacturer's instructions for plumb, level, and flush installation.

B. Secure lockers with anchor devices to suit substrate materials. Minimum pullout force: 100 lbs. Bolt adjoining lockers units together to provide rigid installation.

C. Install bases, end panels, filler panels and accessories.

D. Secure bench with anchor devices to suit substrate. Minimum pullout force: 220 lbs. verify location with architect prior to installation.

3.02 ADJUSTING

A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.

3.03 TOUCH UP PAINT

A. Touch up all marred finished with factory supplied paint. Color shall match finished product.

3.04 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 56 13 METAL STORAGE SHELVING & WORK BENCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work Benches, Work Tables, Metal Shelving and Safety Cabinets as show on the Drawings.

1.02 SUBMITTALS

A. Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. Lyon Metal Products, Aurora, IL. Tel. (603) 892-8941.
2. Eagle Manufacturing Company, Wellsburg, WV. Tel. (304) 737-3171.
3. Penco Products Inc., Oaks, PA. Tel. (610) 666-0500.
4. Stanley Storage Systems, Allentown, PA. Tel. (800) 523-9462.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 STORAGE SHELVING, MODULAR WORK BENCHES AND OPEN WORK BENCHES

A. Storage Shelving: Equal to Penco Products Open Clipper Heavy Duty Steel Shelving Unit Model No. 1H7026, 36 inches wide, 18 inches deep, and 87 inches high with 6 shelves. Quantity: 12, Location: In Mezzanine area as directed in field by MDOT personnel.

B. Storage Shelving: Equal to Penco Products Closed Clipper Heavy Duty Steel Shelving Unit Model No. 1H8026, 36 inches wide, 18 inches deep, and 87 inches high with 6 shelves.
Quantity: As show on drawings in Parts Storage Room.

C. Modular Work Benches: Equal to Pro-Line Brand Model # HDL7230SS-H11, fixed height, work surface stainless steel, length 72 inches, width 30 inches, height 30 inches, capacity 1,000 pounds, thickness 1.25. Work Benches to be bolted to floor.
Quantity: 19

D. Pipe Rack: Equal to Jarke Brand model SC-10J, height 10 feet, arm length 36 inches, capacity per arm 1300 pounds, number of arms: 12, base length: 46 inches, capacity per unit: 16,000 pounds,
Quantity: 3

E. Color: Color to be selected from standard color chart by Project Engineer / MDOT Architect. Refer to Section 09 05 15 – Color Design for color selected.

2.03 SAFETY CABINET

A. Safety Cabinet: Equal to Eagle Manufacturing 90 Gallon Tower™ Safety Cabinet model 1992LEGS. Cabinets shall meet OSHA, NFPA Code 30 and FM approval.

1. Shelves: 2 shelves 30 inches deep.
2. Legs: 4 inches high.
3. Finish Color: Yellow.
4. Dimensions: 43 inches wide by 34 inches deep by 69 inches high.
5. Door Style: 2 manual close.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units plumb and level, in locations and with mountings as shown.

B. Securely attach all components together in accordance with manufacturer's installation instructions.

C. Securely attach units to adjacent units and to wall as required to not move or fall.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 10 56 30 PALLET STORAGE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal pallet storage system as shown on the Drawings.

1.02 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Submit manufacturer's technical product data, color chart and installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Interlake Material Handling and Nashville Wire Products. Local supplier is MSC Industrial Supply Co., Jackson, MS. Tel. (800) 844-3971.

B. Equivalent products by the following manufacturers are acceptable:

1. Penco Products, Oaks, PA. Tel. (610) 666-0500.
2. Wireway / Husky, Denver, NC. Tel. (800) 438-5629.
3. C&H Distributors, LLC, Milwaukee, WI Tel. (800) 558-9966.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 PALLET STORAGE SYSTEM

A. Pallet Rack Upright: Pre-finished metal columns and braces complete with required accessories and hardware, 16,700 lb capacity, 120 inches high x 42 inches deep.

B. Pallet Rack Beam: Pre-finished metal beams complete with required accessories and hardware, 5600 lb capacity, 4 inches x 96 inches.

C. Welded Wire Decking: Galvanized metal welded wire decking complete with required accessories and hardware, 3100 lb capacity, 42 inches x 46 inches.

D. Color: Pre-finished colors to be selected by MDOT Architect from manufacturer's full range of standard colors.

E. Layout of racks is shown on Drawings. Provide three (3) shelves per unit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units plumb and level, in locations and with mountings as shown or as directed by the Project Engineer.

B. Securely attach all components together in accordance with manufacturer's installation instructions.

C. Repair and refinish damaged products. Restore finishes so there is no evidence of corrective Work. Return items to shop that cannot be satisfactorily repaired or refinished in field, make required alterations and refinish entire unit, or provide new units, at Contractor's option.

D. Securely attach units to adjacent units and to wall or floor as required to not move or fall.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 10 57 13 HAT AND COAT RACKS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall mounted tubular steel coat racks.

1.02 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Raymond Engineering, Inc., 704 Vandalia Street, St. Paul, MN 55114. Tel. (800) 365-5770.

B. Equivalent products by the following manufacturers are acceptable:

1. A.J. Binns Ltd., South Burlington, VT. Tel: (802) 655-7502.
2. Magnuson Group Inc., Woodridge, IL. Tel: (800) 342-5725.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 COAT RACK

A. Equal to Rigid – Rak Model 315.

2.03 MATERIALS

A. Brackets (3 req'd per rack) are 1-1/8 inch sq. tubing with mitered angle and hidden weld.

B. Shelf tubes (3 required per rack) are 3 /4 inch round steel tube.

C. Accessories: Model 913 hooks (12 required per rack) mounted on alternate tubes.

D. Finish: Bright commercial nickel chrome.

E. Size: 5 feet long by 12 -1/4 inches deep.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install unit(s) plumb and level, at location(s) shown on Drawings or if not shown, as directed by the ProjectEngineer. A minimum of one unit is required. Securely attach to supporting structure, in accordance with manufacturer's installation instructions.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage.

END OF SECTION

SPECIFICATION 10 73 16 ALUMINUM CANOPY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-I Specification Sections, shall apply to work specified in this Section.

1.02 GENERAL DESCRIPTION OF WORK

A. Work in this section shall include design, fabrication and installation of complete welded, extruded aluminum protective cover system. All work shall be in complete accordance with the drawings and this specification.

1.03 REFERENCES

A. Section 03 10 00 “Concrete Forming and Accessories.

B. Section 05 50 00 “Metal Fabrications.

C. Section 07 62 00 “Sheet Metal Flashing and Trim.

D. Section 07 92 00 “Joint Sealants”.

1.04 RELATED SECTIONS

A. Concrete Work Section 03 10 00

B. Miscellaneous Metals Section 05 50 00

C. Flashing and Sheet Metal Section 07 62 00

D. Sealants Section 07 92 00

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.

B. Shop Drawings: Submit complete shop drawings including all necessary plan dimensions, elevations and details. General Contractor shall verify all dimensions and provide elevations at each column, finish floor, and related soffit before releasing to manufacturer for fabrication.

C. Certification: Submit design calculations signed by a Registered Professional Engineer, licensed in the project state. Design calculations shall state that the protective cover system

design complies with the wind requirements of ASCE 7-95, the stability criteria of applicable building code, and all other governing criteria.

1.06 QUALITY ASSURANCE

A. Protective Cover shall be wholly produced by a recognized manufacturer with at least five years experience in the design and fabrication of extruded aluminum walkway cover systems. Components shall be assembled in shop to greatest extent possible to minimize field assembly. Protective cover shall be installed by manufacturer. Third party installation is not acceptable. Protective cover system, including material and workmanship, shall be warranted from defects for a period of one year from date of completion of installation.

PART 2 - PRODUCT

2.01 MANUFACTURERS

A. Contract documents are based on products manufactured by:

- Peachtree Protective Covers, Inc.,
  1477 Rosedale Drive, Hiram, GA 30141
  770/439-2120, fax 770/439-2122
  800/341-3325,
  ppc@peachtreecovers.com , www.peachtreecovers.com

- E.L. Burns Company, Shreveport, LA

- Dittmer Architectural Aluminum, Winter Springs, FL

B. Other manufacturers will be considered for substitution only when the following conditions are met:

2.02 DESIGN

A. Protective cover shall be all welded extruded aluminum system complete with internal drainage. Non-welded systems are not acceptable.

B. Roll formed deck is not acceptable. Expansion joints shall be included to accommodate temperature changes of 120°F. Expansion joints shall have no metal to metal contact.

2.03 MATERIALS

A. Aluminum Members: All sections shall be extruded aluminum 6063 alloy, heat treated to T-6 temper.

B. Fasteners: Fasteners shall be aluminum, 18-8 stainless steel or 300 series stainless steel.

C. Protective Coating: Aluminum columns embedded in concrete shall be protected by clear acrylic.

D. Grout: Grout shall be 2000 p.s.i. compressive strength, 1 part Portland cement and 3 parts masonry sand. Add water to produce pouring consistency.

E. Gaskets: Gaskets shall be dry seal santoprene pressure type.

2.04 COMPONENTS

A. Columns: Columns shall be radius-cornered tubular extrusion of size shown on drawings with cutout and internal diverter for drainage where indicated. Circular downspout opening in column not acceptable.

B. Beams: Beams shall be open-top tubular extrusion of size and shape shown on drawings, top edges thickened for strength and designed to receive deck members in self-flashing manner. Structural ties shall be installed in tops of all beams.

C. Deck: Deck shall be extruded self-flashing sections interlocking into a composite unit. Closures at deck ends shall be welded plates.

D. Fascia: Fascia shall be manufacturer's standard shape. Size as indicated on drawings.

E. Flashing: Flashing shall be .040 aluminum (min.). All thru-wall flashing by others.

2.05 FABRICATION

A. Bent Construction: Beams and columns shall be factory welded with neatly mitered corners into one-piece rigid bents. All welds shall be smooth and uniform using an inert gas shielded arc. Suitable edge preparation shall be performed to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints shall be used when shipping limitations prohibit the shipment of fully welded bents.

B. Deck Construction: Deck shall be manufactured of extruded modules that interlock in a self-lashing manner. Interlocking joints shall be positively fastened at 8" O.C. creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Deck shall be assembled with sufficient camber to offset dead load deflection.

2.06 FACTORY FINISHING

A. Finish shall to be clear anodized, AA-M-10 C-22 A-41 (AAMA 611)

PART 3 - EXECUTION

3.01 PREPARATION

A. Erection shall be performed after all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.02 INSTALLATION

A. Column Sleeves: Column sleeves (styrofoam blockouts) or anchor bolts (if required) shall be furnished by Peachtree Protective Covers, Inc. and installed by the General Contractor.

B. Erection: Protective cover shall be erected true to line, level and plumb. Aluminum columns embedded in concrete shall be protected by clear acrylic. Downspout columns shall be filled with grout to the discharge level to prevent standing water. Non-draining columns shall have weep holes installed at top of concrete to remove condensation.

3.03 CLEANING

A. All protective cover components shall be cleaned promptly after installation.

3.04 PROTECTION

A. Extreme care shall be taken to protect materials during and after installation.

END OF SECTION

SECTION 10 82 15 ARCHITECTURAL SCREEN WALL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Materials, labor, equipment and services necessary to furnish, deliver and install aluminum screen walls complete with framing, and hardware as shown on the Drawings and as specified herein.

1.02 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications

B. Section 09 05 15 – Color Design

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, technical data, and installation instructions for required products, including finishes and color samples.

B. Shop Drawings: Submit shop drawings for fabrication and reaction of screen units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

1.04 QUALITY ASSURANCE

A. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

B. Field Measurements: Verify size, location and placement of screen units prior to fabrication, wherever possible.

C. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, mechanical attachment and field assembly of units. Pre-assemble units and ship to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for unit re-assembly and coordinated of installation.

1.05 WARRANTY

A. Paint Finish: Paint finish shall have a 20-year guarantee against cracking, peeling and fade (Not to exceed 5 N.B.S. units).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by Construction Specialties, Inc., 49 Meeker Ave., Cranford, NJ 07016. Tel. (908) 272-5200.

B. Equivalent products by the following manufacturers are acceptable:

1. All-Lite Louvers. Mineral Wells, WV. Tel. (304) 489-8113.
2. Ruskin Manufacturing, Kansas City, MO. Tel. (816) 761-7476.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B 211, Alloy 6063-T52.

B. Clip Angles: Structural grade aluminum.

C. Fastenings: Fasteners shall be aluminum or stainless steel. Provide types, gauges and lengths to suit unit installation conditions.

D. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or lead expansion bolt devices for drilled-in place anchors.

2.03 FABRICATION GENERAL

A. Provide Architectural Screen equal to C/S Vert-a-Cade 301 Screen and accessories of design, materials, sizes, depth, arrangement, and metal thickness as indicated or as required for optimum performance with respect to strength; durability; and uniform appearance.

B. Include supports, anchorages, and accessories required for complete assembly.

2.04 SCREEN CONSTRUCTION

A. Blades shall be fabricated from extruded aluminum sections in 6063-T52 alloy, minimum .081 inch thick and spaced approximately 6-3/4 inches on center. Blades to be nominal 4 inches deep, supported and lined up with heavy gauge extruded aluminum blade braces positively interlocked to each blade and mechanically secured to extruded aluminum supports. Aluminum supports fixed directly to horizontal or vertical steel supports, by Contractor, and to spandrel beams with extruded aluminum clip angles. All fasteners shall be stainless steel or aluminum. Material shipped knocked down for field assembly by the installer. Aluminum supports and blade braces to be in mill finish.

2.05 ALUMINUM FINISH

A. General: Comply with NAAMM “Metal Finishes Manual” for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.

B. Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 mil minimum dry film thickness, and thermo-cured fluorocarbon coating containing “Kynar 500” resin, 1.0mil

minimum dry film thickness. Furnish manufacturer's twenty (20) year guarantee of "Kynar 500" finish.

C. Color: Provide Color as indicated in Section 09 05 15 – Color Design or, if not otherwise indicated, as selected by Project Engineer / MDOT Architect from full range of C/S Standard and Premium Kynar 500 colors.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorage. Coordinate delivery of such items to Project Site.

3.02 INSTALLATION

A. Locate and place aluminum screen units plumb, level and in proper alignment with adjacent Work. Use concealed anchorage wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces.

B. Form tight joints with exposed connections accurately fitted together.

C. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective Work. Return items that cannot be refinished in field to manufacturer, make required alterations and refinish entire unit, or provide new units, at manufacturer's option.

D. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry or dissimilar metals.

E. Use isolation tape where aluminum comes in contact with steel or concrete.

END OF SECTION

SECTION 11 31 15 RESIDENTIAL APPLIANCES AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Residential appliances as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit manufacturer's brochures, technical data, installation, maintenance and operating instructions for each item and component part specified, including data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent products by the following manufacturers are acceptable:

1. GE Appliances, Louisville, KY. Tel. (800) 626-2000.
2. Ice-O-Matic, Denver, CO. Tel. (303) 371-3737.
3. Magic Chef Co., Cleveland, TN. Tel. (423) 472-3371.
4. Manitowoc Ice, Inc., Manitowoc, WI. Tel. (800) 545-5720.
5. Scotsman Ice System, Vernon Hills, IL. Tel. (847) 215-4500.
6. Sears Contract Sales, Hoffman Estates, IL. Tel. (847) 286-2994.

B. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 APPLIANCES

A. Refrigerator: 25.3 cu. ft. capacity Side-By-Side with Dispenser equal to GE Model GSH25JFXCC with factory-installed icemaker, Bisque.

B. Microwave: 1.70 cu. ft. oven cavity, 1000 watts, over-the-range vented type, equal to GE Model JVM 1750DMCC with Re-circulating Charcoal Filter Kit Model JX81A, Bisque.

C. Ice Machine: Equal to Model [C0330MA-1A]-300lb. Cube Ice Machine by Scotsman. Power supply shall be 115/60/1. Ice Storage Bin Model B330P – 270 lbs. ARI Bin storage capacity.

PART 3 - EXECUTION

3.01 PREPARATION AND COORDINATION

A. Verify and provide all plumbing and electrical hook-ups, drains and electrical outlets required for proper operation by the appliances specified prior to rough-in. Coordinate with Electrical and Plumbing subcontractors.

3.02 INSTALLATION

A. Install units plumb and level, in locations and with mountings as shown. Securely attach to supporting structure with concealed fasteners, and in accordance with manufacturer's installation instructions.

B. Remove shipping packaging and install components as per manufacturer’s instructions.

C. Modify (if required) swing of refrigerator door to open toward adjacent base cabinets. Coordinate with cabinets for proper fit.

3.03 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 11 52 16 PROJECTORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. LCD Projector, ceiling mounted with accessories as required for a complete system as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit manufacturer's brochures, technical data, installation, maintenance and operating instructions for each item and component part specified, including data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and Specifications are based on products manufactured by NEC, 1250 N. Arlington Heights Rd, Itasca, IL. 60143. Tel. (800) 836-0655.

B. Equivalent products by the following manufacturers are acceptable:

1. Panasonic PT-LB60NTU.
2. Sony VPL-CX86.

C. Substitutions shall fully comply with specified requirements and Section 01630-Product Options and Substitution Procedures.

2.02 PROJECTOR

A. Equal to NEC model LT-380 as follows:

1. 3000 Lumens.
2. 600:1 Contrast Ratio.
3. 1024 x 768 Resolution.
4. 4:3 Aspect Ratio.
5. Wireless Networking

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install units plumb and level, in locations and with mountings as shown or as required. Securely attach to supporting structure with concealed fasteners, in accordance with manufacturer's installation instructions.

B. Remove shipping packaging and install components as per manufacturer’s instructions.

C. Verify and provide all electrical hook-ups and electrical outlets required by the projector specified prior to rough-in.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 12 21 14 HORIZONTAL LOUVER BLINDS-METAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Horizontal louver blinds at exterior windows.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of blind unit required. Include methods of installation for each type of opening and supporting structure. Transmit copy of instructions and recommendations to the installer.

B. Samples: Submit samples of each exposed metal finish, cords, tapes and tassels required. Architect's review of samples will be for design, color, and finish only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.03 QUALITY ASSURANCE

A. Provide each blind as a complete unit produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings. Unless otherwise acceptable to the Project Engineer / MDOT Architect, furnish all blind units by one manufacturer for the entire project.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Drawings and specifications are based on products manufactured by Hunter Douglas, Inc., 2 Park Way, Upper Saddle River, NJ 07458. Tel. (800) 727–8953.

B. Other Acceptable manufacturers offering equivalent products:

1. Levolor Home Fashions Contract Division, High Point, NC. Tel. (336) 812-8181.
2. Springs Window Fashions Division, Inc., Montgomery, PA. Tel. (570) 547-6671.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 PRODUCTS

A. Hunter Douglas Commercial Lightlines Aluminum Blinds 1” de-Light Model DL88. Color to be selected by the Project Engineer / MDOT Architect from manufacturers’ full line of standard colors. Refer to Section 09 05 15 – Color Design for color selected.

2.03 MATERIALS AND COMPONENTS

A. Manufacturer's standard head rail, channel-shaped section fabricated from minimum 0.040 inch thick aluminum. Increase metal thickness as recommended by the manufacturer for large blind units. Cross-brace for extra rigidity. Furnish complete with tilting mechanism, top and end brace, top cradle, cord lock, and accessory items required for the type of blind and installation indicated.

B. Bottom Rail: Manufacturer's standard tubular steel bottom rail designed to withstand twisting or sagging. Contour top surface to match slat curvature, with flat or slightly curved bottom. Close ends with manufacturer's standard metal or plastic end caps of the same color as rail. Finish rails the same color as slats, unless otherwise indicated.

C. Slats: Manufacturer's standard, spring tempered aluminum slats not less than 0.008 inches thick. Provide l inch narrow slats, with other components sized to suit.

D. Braided Ladders: Manufacturer's standard polyester support cords with integrally braided ladder rungs. Provide cord size and rung spacing as required for each type of blind shown.

E. Tilter: Manufacturer's standard enclosed, lubricated, tilting mechanism which will tilt and securely hold the tilting rod, slats and bottom rail at any set angle. Furnish wand (or rod) type tilter consisting of standard tilter mechanism adopted for rotating wand operation. Furnish manufacturer's standard plastic or aluminum rod of proper length to suit blind installation.

F. Cords: Manufacturer's standard braided polyester cord, sized to suit blind type, equipped with soft-molded plastic rubber or composition tassels securely attached to each cord end.

1. Cord Locks: Provide manufacturer's standard cord locks for each type of blind.
2. Cord Equalizers: Nylon, self-aligning type, designed to maintain horizontal blind position.

G. Hardware: Furnish manufacturer's standard brackets, supports and internal reinforcement as required to suit blind type and size. Finish exposed hardware and accessories to match rail color.

H. Finish: Prime aluminum slats with chromate conversion coating, followed by manufacturer's standard glass-smooth, baked-on synthetic resin enamel finish.

2.04 FABRICATION AND OPERATION

A. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust blind dimensions for proper fit in all openings. Fabricate components of blinds from non-corrosive, non-staining, non-fading materials which are completely compatible with each other, and which do not require lubrication during normal expected life.

B. Fabricate blind units to completely fill the openings as indicated, from head to sill and jamb to jamb. Space supporting tapes or cords in accordance with manufacturer's standards, unless otherwise indicated. Space louver blades (slats) to provide overlap for light exclusion when in the fully closed position.

C. Equip blind units, unless otherwise indicated, for the following operation:

1. Full-tilting operation with slats rotating approximately l80 degrees. Place tilt operation controls on left-hand side of blind units.
2. Full-height raising, to manufacturer's minimum stacking dimension with lifting cord locks for stopping blinds at any point of ascending or descending travel. Place pull cords on right-hand side of blind units.

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine the substrates and conditions under which the horizontal venetian blinds are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION

A. Install horizontal venetian blinds at each window and in accordance with the manufacturer's instructions unless noted otherwise. Provide intermediate supports at intervals to permit easy entrance and removal of head, and to ensure level head and slat position.

END OF SECTION

SECTION 12 48 43 FLOOR MATS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal-rails, tapered vinyl-frame, surfaced mounted, removable, carpeted floor mats for Building Entrances.

1.02 RELATED SECTIONS

A. Section 09 05 15 – Color Design.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers' product and technical data indicating compliance with these specifications and recommended maintenance practices.

B. Shop Drawings: Submit materials description, component dimensions and details. Show plan view that clearly indicates traffic direction and size of mat.

C. Colors: Submit samples of manufacturer's full range of available colors (minimum 20 for carpet) and finishes for materials exposed to view.

1.04 QUALITY ASSURANCE

A. Single Source: All floor mats required by this Section shall be products of only one manufacturer.

B. Manufacturer : Company regularly engaged in producing types of floor mats required by this Section and with minimum 10 years documented satisfactory experience

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Construction Specialties, Inc. P.O. Box 380, Muncy, PA 17756. Tel. (888) 834-4455.

B. Other acceptable manufacturers offering equivalent products:

1. Arden Architectural Specialties, Inc., Saint Paul, MN. Tel. (651) 631-1607.
2. J.L. Industries, Inc., Bloomington, MN. Tel. (612) 835-6850.
3. R. C. Musson Rubber Co., Akron, OH. Tel. (330) 773-7651.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 FLOOR MATS

A. Equal to C/S "Pedimat" Surface-Mounted Floor Mat, Model M1-D-HD-SM.

B. Size: 6 feet wide by 4 feet deep (traffic direction) at double doors; 4 feet wide by 4 feet deep (traffic direction) at single doors.

C. Carpet Color: As selected by Project Engineer / MDOT Architect from full range of manufacturer's 25 standard colors.

D. Rails: Extruded aluminum 6063-T52 as selected by Project Engineer / MDOT Architect from full range of manufacturer's 7 optional anodized colors.

E. Carpet tread: Colorfast, solution dyed nylon tread, in color selected by Project Engineer / MDOT Architect, fusion bonded to rigid two-ply backing supplied in continuous splice-free lengths. Anti-static carpet fiber shall contain an antimicrobial additive and "Scotchgard" soil reducing treatment.

F. Frame: Tapered vinyl with mitered corners. Color as selected by Project Engineer / MDOT Architect from full range of manufacturer's six standard colors (match rail color).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install unit(s) level, in locations as shown or described. Install mats after Final Cleaning of Project Floor.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 13 34 19 METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building Type: The building is a single-story, single-span, rigid-frame-type pre-engineered metal building of the nominal length, width eave height, and roof pitch indicated.

B. Roof system: Standing-seam roof with thermal insulation blankets, concealed clips and factory-applied sealant.

C. Components and Accessories: Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

1.02 RELATED SECTIONS

A. Plywood wainscot is specified in Section 06 10 00. Cellulose thermal insulation is specified in Section 07 21 28. Personnel doors and frames and finish hardware are specified in Sections 08 11 13 and 08 71 00. Overhead service doors, including operators, are specified in Section 08 33 23. Colors are specified in Section 09 05 15 - Color Design. Painting for ferrous metal exposed to view is specified in Section 09 90 00 - Painting and Coating. Canopies are specified in Section 10 73 16.

1.03 STRUCTURAL FRAMING AND ROOF AND SIDING PANELS

A. Design anchor bolts, structural members, and exterior covering for applicable loads and combinations of loads in accordance with the MBMA's "Design Practices Manual."

B. Structural Steel: Comply with AISC's "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

C. Light Gage Steel: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.

D. Welded Connections: Comply with AWS's "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

E. Metal Roofing: Comply with SMACNA Architectural Sheet Metal Manual.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's sample warranty and product information for building components, accessories and color chart.

B. Shop Drawings: Submit Shop Drawings for anchor bolts, structural framing system, roofing and siding panels, and components and accessories not fully detailed or dimensioned in manufacturer's product data.

1. Structural Framing: Furnish erection drawings. Include fabrication and assembly details. Show anchor bolts' settings and sidewall, end-wall, and roof framing.
2. Sheet Metal Accessories and Roofing: 1/4-inch-scale layouts and 1-1/2-inch-scale details of accessories; show profiles, methods of joining to system

components and dissimilar building materials, flashing of each condition for roof penetrations, and anchorage.

C. Certification prepared, signed, and sealed by a Professional Engineer registered in the State of Mississippi, verifying that anchor bolts, structural framing and covering panels meet loading requirements and codes (IBC 2009), including design calculations.

D. Installer certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer, with 5 years minimum experience, who specializes in erection of building similar to that required and is certified by the building manufacturer as qualified for erection of the manufacturer's products.

B. Manufacturer's Qualifications: Provide buildings manufactured by a firm with 10 years experience in manufacturing buildings similar to those indicated. The manufacturer shall be IAS Accredited (Class MB).

C. Welders' Qualifications: Qualify welding processes and welding operations in accordance with the AWS D1.1 "Structural Welding Code".

1. Certify that each welder employed in unit of work of this section has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
2. Testing for re-certification is Contractor's responsibility.

1.06 WARRANTIES

A. Paint Finish: Paint finish shall have a 20-year guarantee against cracking, peeling and fade (Not to exceed 5 NBS vertical / 6 NBS non-vertical units per ASTM D2244-93).

B. Weather Tightness: The entire installation (sub-framing, clips, panels, fasteners, rakes, eaves, ridge/valley flashing conditions, roof to wall conditions as well as all materials specified as supplied by the manufacturer) shall be guaranteed weather tight for a minimum of 20 YEARS. This warranty shall be identified as neither Non-Depreciating, Non-prorated nor have exclusions that identify, valleys, curbs, and flashings. Provide written warranty, signed by the manufacturer and his authorized installer / dealer, agreeing to replace / repair defective materials and workmanship with NO COST to the Owner during the warranty period.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Ceco Building Division, P. O. Box 6500, Columbus, MS 39703. Tel. (662) 328-6722.

B. Equivalent products by the following manufacturers are acceptable:

1. ACI Building Systems, Inc., Batesville, MS Tel. 662-563-4574.
2. Gulf States, Starkville, MS. Tel.: (662) 323-8021.
3. Nucor, Terrell, TX. (972) 524-5407.
4. VP Buildings, Memphis, TN. Tel. (800) 238-3246.

C. Substitutions shall fully comply with specified requirements and Section 01 62 14 - Product Options and Substitution Procedures.

2.02 METAL MATERIALS

A. Hot-Rolled Structural Steel Shapes: ASTM A 36 or A 529.

B. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529, A 570, or A 572. Provide 42,000 psi minimum yield strength.

C. Steel Members Fabricated by Cold Forming: ASTM A 607, Grade 50.

D. Cold-Rolled Carbon Steel Sheet: ASTM A 366 or ASTM A 568.

E. Hot-Rolled Carbon Steel Sheet: ASTM A 568 or ASTM A 569.

F. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: ASTM A 446 with G90 coating complying with ASTM A 525.

G. Aluminum-Zinc Alloy Coated (Galvalume) Steel Sheet: ASTM A792.

H. Aluminum Sheets: ASTM B 209 for Alclad alloy 3003 or 3004 temper required to suit forming operations.

I. Bolts for Structural Framing: ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

J. Mastic: Non-staining saturated vinyl polymer as recommended by panel manufacturer for sealing laps.

2.03 THERMAL INSULATION (Metal Building)

A. Glass-fiber blanket: Comply with ASTM C 167, 0.8 lb. per cubic foot density, 4 inches thickness, R 13, with UL flame spread classification of 25 or less, and 2-inch wide continuous vapor tight edge tabs.

B. Vapor Barrier: Facing shall be equal to Lamtec Corporation model WMP-50. Facing shall be composed of 0.0015 inch white polypropylene film, 5 by 5 tri-directional scrim reinforcing layer, and 0.0005 inch metallized polyester film backing layer. The facing shall have a water vapor transmission rate of 0.02 US perm (ASTM E96, Procedure A), a beach puncture of 125 scale units and a mullen burst of 120 psi. Tensile strength shall be 65 lbs/inch width in the machine direction and 60 lbs/inch width in the cross-machine direction.

C. Retainer Strips: 26 gage (0.0179-inch) formed galvanized steel retainer clips colored to match insulation facing.

2.04 PAINT MATERIALS

A. Comply with performance requirements of federal specifications indicated.

B. Shop Primer for Ferrous Metal: Fast-curing, lead-free, universal primer. Comply with Federal Specification TT-P-645.

C. Shop Primer for Galvanized Metal Surfaces: Zinc dust- zinc oxide primer. Comply with Federal Specification TT-P-641.

D. Unpainted Galvalume: Unpainted Galvalume shall conform to ASTM A792-89 with a coating class of AZ- 55, chemically treated and lightly oiled. All 24 gage unpainted Galvalume used for roof applications shall be grade 80, except when used for trim it shall be grade 50B. All unpainted Galvalume 24-gage and thicker shall be grade 50B.

E. Painted Galvalume: Galvalume used as a substrate for factory applied baked on paint shall conform to ASTM A792-89 with a coating class of AZ-50 or heavier, minimum spangle, chemically treated and lightly oiled, as specified by the coater. All painted Galvalume shall be grade 50B.

1. The paint system shall be applied as follows: Topcoat shall consist of a primer 0.20 - 0.25 mil thick and a top coat 0.70 - 0.80 mil thick, for total film thickness of 1.0 mil. The reverse coat shall consist of a primer 0.20 - 0.25 mil thick and a wash coat backer 0.30 - 0.40 mil thick, for a total film thickness of 0.50 - 0.65 mil.
2. Finish system shall conform to all tests for adhesion, flexibility, and longevity as specified by the finish supplier.

2.05 STRUCTURAL FRAMING

A. Rigid Frames: Factory welded, shop painted, built-up "I-beam" shape or open-web type consisting of tapered or parallel flange beams and STRAIGHT columns with attachment plates, bearing plates, and splice members. Factory drilled for field-bolted assembly. Provide length of span and spacing indicated.

B. Primary End-wall Framing: Provide the following frame members fabricated for field-bolted assembly.

1. End-wall Columns: Shop-painted, built-up factory-welded "I"-shape or cold-formed "C" sections, fabricated from 14-gage (0.0747-inch) steel.
2. End-wall Beams: Shop-painted "C"-shape roll-formed sections fabricated from 14-gage (0.0747-inch) steel.

C. Secondary Framing: Provide the following:

1. Roof Purlins, Sidewall and Endwall Girts: 16 -gage (0.598-inch) shop-painted roll-formed steel "C" or "Z" sections. Fabricate purlin spacers from 14-gage cold-formed galvanized steel sections. Purlins to be 8 inches deep minimum. Girts to be 10 inches deep.
2. Eave Struts: Unequal flange 16-gage (0.0598-inch) shop-painted roll-formed steel "C" sections formed to provide adequate backup for both wall and roof panels.
3. Flange and Sag Bracing: 1-5/8 inch by 1-5/8 inch angles fabricated from 16-gage (0.0598-inch) shop-painted roll- formed steel.
4. Base or Sill Angles: 14-gage (0.747-inch) cold-formed galvanized steel sections.
5. Secondary endwall structural members, except columns and beams, shall be fabricated from 14-gage (0.0747-inch) shop-painted roll- formed steel.

D. Wind Bracing: Provide portal beam wind bracing at rigid frame members. Use manufacturer's standard detail.

E. Bolts: Provide zinc- or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels. In other cases provide shop-painted bolts.

F. Extra Materials: Furnish 5 percent excess over required amount of nuts, bolts, screws, washers, and other required fasteners for each building. Pack in cartons labeled to identify contents and store on site where directed.

G. Shop Painting: Clean surfaces of loose mill scale, rust, dirt, oil, grease, and other matter. Follow procedures of SSPC-SP3 for power-tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.

1. Prime framing members with rust-inhibitive primer.
2. Prime galvanized members after phosphoric acid pretreatment with zinc dust-zinc oxide primer.

2.06 ROOFING AND SIDING PANELS

A. Roof Panel: Double-Lok Standing Seam Panel, 3 inches high with 24 inches wide coverage, 24 gage, Galvalume. Roof shall have a Kynar 500 (70 percent PVDF) color coating finish. Standard colors from manufacturer's full range of colors to be selected by Project Engineer / MDOT Architect.

2.07 STRUCTURAL FRAMING

A. Shop-fabricate framing components to indicated size and section with base plates, bearing plates, and other plates required for erection welded in place. Provide holes for anchoring or connections shop-drilled or punched to template dimensions.

B. Shop Connections: Power-riveted, bolted, or welded shop connections.

C. Field Connections: Provide bolted field connections.

2.08 FLASHING AND TRIM

A. Flashing and trim shall be furnished at eaves, rake, corners, base, framed openings, and wherever necessary to seal against the weather and provide a finished appearance.

B. Pipe flashing units shall be made of flexible rubber compound (EPDM or equal) formulated to provide maximum weathertightness. Unit shall be pre-molded to form a pipe collar. Bonded to base of collar shall be a 1/32 inch (plus or minus) thick, moldable aluminum ring. Pipe flashing shall be furnished with necessary sealant and screw fasteners to attach unit to roof panels and provide a weathertight assembly.

2.09 SHEET METAL ACCESSORIES

A. Provide gutters formed in sections not less than 20 feet in length complete with required special pieces. Join sections with riveted and soldered or sealed joints. Provide required expansion joints with cover plate. Provide gutter supports spaced at maximum 48 inches on center, constructed of same metal as gutters. Provide aluminum wire ball strainers at each outlet. Gutters shall be, 2-gage, roll formed, galvanized steel, ASTM A653 with G90 coating and Kynar 500 (70 percent PVDF) finish. Color shall match roof fascia and rake. Gutters are box-shaped with face profile shaped to match rake trim.

B. Provide downspouts formed in full-length sections complete with required special pieces. Downspouts shall be, 26-gage, roll formed, galvanized steel, ASTM A653 with G90 coating and Kynar 500 (70 percent PVDF) finish. Color shall match roof fascia and rake. Downspouts are rectangular-shaped. Straps shall be spaced 6 feet on center maximum (minimum of 3 required per downspout) and be the same material and finish as

downspout. Strap edges shall be rolled or smooth. Coordinate attachment with aluminum composite panel system manufacturer.

C. Roof Curbs (for equipment) shall be prefabricated using minimum 18 gage AZ 55 prime galvalume steel, or heavier gage (as required). Fully mitered and welded corners. Integral base plates and water cricket or diverter. All welds prime painted after fabrication. Internally reinforced with steel angle on curbs on sides longer than 3'-0". Factory insulated curbs with 1-1/2 inches thick, 3 pounds density fiberglass insulation.

1. Minimum height of curb shall be 8 inches above finished roof.
2. Slope roof curb to match roof pitch and provide a level top

2.10 FASTENERS

A. Wall fasteners shall be No. 14 self-taping, carbon steel screws with an integral, hex-washer head, and without a sealing washer. Minimum length of fasteners shall be 1 inch.

B. Roof fasteners shall be No. 12 self-tapping carbon steel screws with an extended life hexagon head that is compatible with Galvalume panels. A sealing washer shall be provided. Minimum length of fasteners shall be 1 inch.

PART 3 - EXECUTION

3.01 ERECTION

A. Primary Framing: Erect framing required true to line, plumb, level, rigid, and secure. Level base plates to true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use non-shrinking grout to obtain uniform bearing and maintain level baseline elevation. Moist-cure grout for 7 days after placement.

B. Purlins and Girts: Rake or gable purlins shall have tight-fitting closure channels and fascias. Locate and space girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to straight line by sag rods.

C. Bracing: Use movement-resisting frames in lieu of sidewall rod bracing. Rod bracing allowable in roof.

D. Framed Openings: Provide shapes of design and size to reinforce openings and carry loads and vibrations imposed, including equipment furnished under mechanical and electrical Work. Securely attach to building structural frame.

E. Field cutting of exterior panels by torch is not permitted.

F. Sheet Metal Accessories: Install gutters, downspouts, and other accessories for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

G. Thermal Insulation: Install insulation concurrently with roof panels in accordance with manufacturer's directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on underside of roof sheets, extending across top flange of purlin members and held taut and snug to roofing panels with retainer clips. Install retainer strips at each longitudinal joint, straight and taut, nesting with roof rib to hold insulation in place.

H. Roof Panels: Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.

1. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb. Coordinate with mechanical and electrical so that all penetrations through roof occur in flat portion of panel with sufficient space adjacent to penetration to be properly flashed and waterproofed.
2. Attach panels using manufacturer's standard Concealed clips and fasteners, spaced in accordance with approved Shop Drawings.
3. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
4. Install sealants for preformed roofing panels as specified on Shop Drawings.
5. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
6. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
7. Remove and replace panels or components that are damaged beyond successful repair.

3.02 CLEANING AND TOUCH-UP

A. Clean component surfaces. Touch up abrasions, marks, skips, or other defects to shop-primed surfaces with same material as shop primer.

END OF SECTION

SECTION 14 45 00 HEAVY DUTY FOUR POST DRIVE-ON VEHICLE LIFT

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Extent of heavy duty four post drive-on hydraulic lift is indicated on the drawings and the provisions of this section.

1.02 QUALITY ASSURANCE

A. All equipment shall be new and unused. The model bid must be the manufacturer's current production model. Used, reconditioned, left over or discontinued models will not be accepted.

B. Equipment must be supplied with all ANSI, Automotive Lift Institute Safety Data, Safety Booklets, ANSI/ALI OIM Standard #ALOIM-1004, and Lift Point Guide. ANSI Safety decals must be permanently placed on the lift in clear view of the operator.

C. The manufacturer must be a firm regularly engaged in the design and manufacturing of the type of equipment specified herein for a minimum of 3 years.

D. Equipment being offered must be a model that has been I production for a minimum of 3 years.

E. All material thickness and structural dimensions are minimum dimensional tolerances unless noted are as follows; ± 0.25 inches for dimensions less than 10 inches; ± 1.0 inches for dimensions from 10 inches to 5 feet inclusive; ± 3.0 inches for dimensions greater than 5 feet.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each principal component or product, and include certified reports on required testing.

B. Shop Drawings: Submit plans, elevations and details for complete installation.

1.04 WARRANTY

A. Standard warranty on all structural components and power unit. Warranty is a full 3 years. Parts, labor, shipping, and travel are all included.
B. Hydraulic cylinders are covered by an "Extended Lifetime Cylinder Warranty" after the initial 3 year warranty has expired.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on products manufactured by Mohawk Lifts, 65 Vrooman Ave., Amsterdam, NY 12010. Tel. 1-800-833-2006. Model # TR-25/30, 25,000 lb. Capacity Medium Duty Drive On Four Post Vehicle Service Lift.

B. Equivalent products by the following manufacturers are acceptable:
1. Rotary Lift
2. Stertil-Koni

C. Substitutions shall fully comply with specified requirements and Section 01 62 14-Product Options and Substitution Procedures.

2.02 EQUIPMENT

A. Complete assembly shall consist of an electric over hydraulic lift unit, controls, and any accessories as specified herein.

B. Lifting capacity will be 25,000 pounds minimum.

C. Lifting stroke will be 69-5/16 inches minimum. This dimension is measured from the floor to the top of the track when the lift is at full height.

D. Track length will be a minimum of 31feet 2-3/16 inches of useable track space.

E. Approach ramps will be a minimum of 5 feet 11-9/16 inches. They will have a maximum approach angle of 8°. Ramps must have a diamond plate non-skid surface. Approach ramps with a steeper approach angle or ramps with a smooth flat surface are not acceptable.

F. Approach ramps will be attached to the lift and raised up with the lift to act as a wheel chock when the lift is raised. Stationary or floor mounted approach ramps are not acceptable.

G. The lift shall incorporate mechanical locks in all 4 posts. Each lock must start within seventeen (17) inches off the ground and lock every eight (8) inches thereafter until the lift reaches full height.

H. All (4) mechanical locks must engage automatically when the lift is raised. All locks engage automatically every eight (8) inches.

I. The mechanical locks are released by a single point lock release that is located on power side column.

J. Lifting speed will be 120 seconds minimum from the floor to full height.

2.03 LIFTING COLUMN

A. Each column is constructed of specially formed shaped of A-36 steel plate containing welded lock supports every eight (8) inches.

B. Each column will have a base plate made from ½” steel plate, minimum. The base plate will be 12” x 12” minimum. This base plate is designed to have less than 50 PSI of pressure on the concrete floor with a full load.

2.04 CROSS RAILS

A. The cross rails will be constructed of 5 inches x 7 inches x ¼ inches thick structural tubing and bearing support plates. The cross rails also serve as a busway for the lock release mechanism and synchronizing chain. Smaller (more flexible) diameter or lighter duty tubing is not acceptable.

2.05 TRACKS

A. Each track will be constructed of (3) 8 inch x 4 inch structural I-beam welded together by 3 point fillet welds. Tracks that are constructed of smaller, (more flexible), lighter duty I-beam or formed tracks are not acceptable.

B. The surface of each track will be cover by skid resistant ¼" diamond plate welded to the top of the I-beam by a continuous fillet weld.

C. Useable track length will be no less than 231' 2-3/16".

D. Standard track width will be a minimum of 24" wide, to give 4' between track under-vehicle access. Narrower tracks not allowing dual wheels to be safely positioned on the tracks are not acceptable.

2.06 LIFT DIMENSIONS

A. Overall length will be no more than 37 feet 3-1/16 inches.

B. Overall width will be no wider than 12 feet 6-3/16 inches wide. (Adjustable to desired widths).

C. Inside drive thru clearance will be no less than 11 feet 0 inches. (Adjustable to desired widths).

D. Column Height will be no more than 8 feet 5-7/16 inches.

E. Runway height at full stroke will be no less than 5 feet 9-5/16 inches.

F. Approach ramps will be 5 feet 11-9/16 inches long.

G. Approach ramps will have an 8° approach angle. Steeper approach angles will not be accepted.

H. Approach Ramps will have a diamond plate non-skid surface.

I. Each ramp will have four (4) rollers built into the ramp tip so that the end of the approach ramp does not drag along gouging, digging, and scrapping the concrete floor.

J. Each roller will be made of CF-1018 round steel that measures 3" in diameter x 5-3/8" in length. Each ramp must have a minimum of four (4) rollers each.

K. Inside track clearance will be 48" minimum for full access to the vehicle undercarriage. Lifts that have less than 48" between the tracks are not acceptable.

2.07 POWER UNIT

A. Electric motor is 2 HP 208V / 230V 1 Phase 60hz minimum. The motor will have maximum full amp loads of 17.4 amps at 208V and 14.6 amps at 230V.

B. Power unit can be mounted on either driver side or passenger side column, front or rear of the lift.

C. Power unit will consist of:

a. Electric motor
b. Hydraulic pump
c. Steel oil reservoir, plastic not acceptable
d. Suction strainer
e. Hydraulic gear pump
f. All hydraulic valving manifold

2.08 CONTROL SYSTEM

A. Unit shall incorporate two handed control system to prevent accidental injury to personnel. “RAISE” shall require operator to hold two momentary contact (deadman) switches and “LOWER” shall require operator to hold lowering valve and mechanical safety release simultaneously. Single button actuators or non-returning safety releases shall be unacceptable.

B. Unit shall incorporate internal velocity fuse and pressure compensated flow control valves.

C. Velocity fuse shall completely stop descent in the event of a hydraulic failure. Flow restrictor type hydraulic safeties shall not be acceptable.

D. “UP” button shall be affixed to column, remote control devices which allow operators to walk under moving lifts shall not be acceptable.

E. Motor and pump assemble shall be all steel to protect against damage. Plastic reservoirs or plastic main disconnect switches shall not be acceptable.

F. Control system shall use thermal protection against overheating cartridge fuses of any kind are not permissible.

2.09 HYDRAULICS

A. Hydraulic pump is a pressure balanced gear pump with fixed displacement, external tooth, and all steel gears. The pump must be extremely tolerant of fluid contaminants and resistant to galling caused by low viscosity start-up. Hardcoat processed internal pump surfaces for extended service lift.

B. Hydraulic cylinders will be made of 1-1/2 inch chrome rod. The oversized chrome rod will be packed in a 5-1/2 inch wide x 5 feet 5 inch long barrel, minimum.

C. Full load working pressure will be a maximum of 2,600 psi.

D. Cylinder packing consists of:

a. Dynamic piston t-seals
b. 2 back-up rings
c. 2 static o-rings
d. Rod wiper
e. Rod t-seals

E. External hydraulic safeties shall consist of a velocity fuse mounted on the cylinder to prevent collapse in the event of a leak, plus a factory set pressure compensated flow control valve to limit descent speed.

F. The hydraulic pressure hose is a Parker #301-6, No-Skive 3/8" O.D. with a 0.075 wall thickness. Maximum working pressure is 4,000 psi. Maximum burst pressure is 20,000 psi.

G. The return line hose is a Parker #301-4, No-Skive ¼" O.D. with a 0.59 wall thickness. Maximum working pressure is 5,000 psi. Maximum burst pressure is 20,000 psi.

H. All hydraulic fittings will be standard JIC or O-ring boss fittings. Self flaring or compression fittings are not acceptable.

I. Hydraulic fluid will be Dexron III, ATF.

2.10 LIFTING CHAIN

A. The hydraulic cylinder is connected to (4) BL-646 leaf chains. Each lifting chain has a capacity of 27,000 pounds. Cable or mechanical lifting devices are not acceptable.

B. Each chain rides over 2-3/4 inch heat treated chain bearings with integral needle bearings with dual lubri-disc seals.

2.11 STANDARD EQUIPMENT

A. (4) Wheel chocks

B. (16) ¾ inch x 5 inch WEJ-IT Anchor bolts

C. Touch-up paint, 1 can of each color

D. Track Light Kit

E. 3 Feet Tracks Extensions

F. DEXRON III ATF for hydraulic pump and reservoir

G. Shims to level the columns for proper installation.

H. Safety and Operations Manual.

I. ANSI/ALI OIM Booklet (ALI standard #ALOIM-1994)

J. ANSI/ALI Lifting It Right Booklet (ALI Standard # SM93-1)

K. ANSI/ALI Lifting Point Guide Booklet (ALI Standard # ALI/LP-GUIDE)

L. ANSI/ALI Safety Decals affixed to lift.

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

A. Upon nominal completion of lift, perform acceptance tests as required and recommended by manufacturer.

3.02 PROTECTION

A. Installer shall advise Contractor of recommended protection procedures, to prevent damage and deterioration of completed work.

3.03 INSTRUCTION AND MAINTENANCE

A. Instruct Owner's personnel in proper use, operations and daily maintenance of lift. Review emergency provisions. Train owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make final check of lift operation just prior to time of Date of Completion. Determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 14 83 16 HYDRAULIC SCISSOR LIFT TABLE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Division 03 Sections: Concrete
B. Division 05 Sections: Miscellaneous Metals for steel supports.
C. Division 26 Sections: Electrical connections and service for operators.

1.02 DESCRIPTION OF WORK

A. Work described in this Section includes providing equipment, incidental material and labor required for complete, operable hydraulic platform lift installation. Where singular reference is made to lifts or lift components, such reference shall apply to number of lifts or components required to complete installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.

1.03 PREPARATORY WORK BY OTHERS

A. The following preparatory work to receive the lifts specified in this Section is part of the work by others:

1. Permanent 460 V, 3-phase power to operate lift to be provided as per manufacturer's requirements.
2. Provide rough openings as per lift contractor's shop drawings.
3. Provide substantial level pit floor slab as indicated on the lift contractor's shop drawings.

1.04 QUALITY ASSURANCE

A. All equipment shall be new and unused. The model bid must be the manufacturer's current production model. Used, reconditioned, left over or discontinued models will not be accepted.

B. The manufacturer must be a firm regularly engaged in the design and manufacturing of the type of equipment specified herein for a minimum of 3 years.

1.05 SUBMITTALS

A. Shop Drawings: Submit plans, elevations and details for complete installation.

B. Submit physical samples of all items requiring selection of color or finish.

1.06 WARRANTY

A. Standard warranty on all structural components and power unit. Warranty is a full 3 years. Parts, labor, shipping, and travel are all included.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ECOA Industrial Products
B. Pentalift Equipment Corporation
C. Or approved Equal

2.02 EQUIPMENT

A. Triple Scissor Lift (Based on ECOA Model #TSL-60-180-72120)
1. Industrial Lift Capacity (centered): 6,000 pounds minimum.
2. Base Size: 60x93
3. Platform Size: 72x120
4. Deck Surface: Steel Plate – Non-slip
5. Travel Distance: 180 inches
6. Toe Guard Style: Beveled
7. Power Unit H.P.: 5
8. Power Unit: External
9. Controls: Push Button
10. Control Cord: 20 feet
11. Upper Limit Switch: Yes
12. Handrails: Yes
13. Chains: Yes
14. Bridge Plate: 18x72
15. Color: Safety Yellow
16. Hose: 10 feet
17. Limit Switch Wire: 10 feet
18. Hydraulic Oil in gal: Yes
19. Maintenance bars included as standard
20. Provide interlock for gates
21. Pit-mounted unit

B. Scissor Lift Table (Based on ECOA Model #HDL-060-608-F)
1. Dock Lift Capacity: 10,000 pounds minimum
2. Base Size: 63x88
3. Platform Size: 72x96
4. Deck Surface: Steel Plate – Non-slip
5. Travel Distance: 60 inches
6. Toe Guard Style: Beveled
7. Power Unit H.P.: 5
8. Power Unit: External
9. Controls: Push Button
10. Control Cord: 20 feet
11. Upper Limit Switch: Yes
12. Handrails: Yes
13. Chains: Yes
14. Bridge Plate: 18x72
15. Color: Safety Yellow
16. Hose: 20 feet
17. Limit Switch Wire: 20 feet
18. Hydraulic Oil in Gal.: Yes
19. Maintenance bars included as standard
20. Pit-mounted unit

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

A. Contractor to coordinate pit dimensions with manufacturer's requirements prior to foundation installation.

B. Upon nominal completion of lift, perform acceptance tests as required and recommended by manufacturer.

3.02 PROTECTION

A. Installer shall advise Contractor of recommended protection procedures, to prevent damage and deterioration of completed work.

3.03 INSTRUCTION AND MAINTENANCE

A. Instruct Owner's personnel in proper use, operations and daily maintenance of lift. Review emergency provisions. Train owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make final check of lift operation just prior to time of Date of Completion. Determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 21 13 13 FIRE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Refer to the following sections for related work in connection with fire protection piping system:

1. 23 0500 Mechanical General
2. 23 0511 Submittals
3. 23 0553 Identification

1.02 SUMMARY

A. The extent of the fire protection work required is indicated on the Drawings and schedules and by the requirements of this Specification section.

B. Fire protection work shall include but not be limited to the following:

1. Automatic sprinkler systems.
2. Underground feed main to connection provided outside building by utility contractor.
3. Installation of water flow switches and valve supervisory switches.
4. Painting of piping.

C. The following is not considered part of this section:

1. Wiring of water flow switches and valve supervisory switches.
2. Fire extinguishers and cabinets.

1.03 DESIGN CRITERIA:

A. Provide a complete automatic sprinkler system, hydraulically designed to provide the following sprinkler protection:

BUILDING AREA	HAZARD	DESIGN DENSITY GPM/SF	REMOTE AREA OF APPLICATION	MAXIMUM SP. HEAD SPACING	INTERIOR HOSE STREAM
Offices, Toilet Rooms, Conference Room	Light	0.10	1500 SF	225 SF	100
Work Bays, Parts Storage, Storage Areas	ORD. GP.1	0.12	3000 SF	130 SF	250

B. All areas of the building shall be completely sprinklered including the following areas:

1. Electrical Equipment Room
2. Communication Room

1.04 QUALITY ASSURANCE:

A. Manufacturing firms shall be regularly engaged in the manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Fire Protection System Installation firms with at least five (5) years of successful installation experience on projects with fire protection work similar to that required for the project.

1.05 CODES AND STANDARDS:

A. Install fire protection systems in accordance with the latest edition of the following National Fire Protection Association Standards:

1. NFPA 13 "Installation of Sprinkler Systems",2010.
2. NFPA 24 "Installation of Private Fire Mains", 2010.

B. Provide fire protection products which have U.L. Listing or are listed in the latest edition of the "Factory Mutual Approval Guide."

C. Comply with local Fire Department regulations for sizes, hose threads and arrangement of connections for fire department equipment to siamese fire department connection.

1.06 SUBMITTALS:

A. Submit manufacturer's technical product data and installation instructions for fire protection materials and products.

B. Prepare one eighth (1/8") minimum scale shop drawings for fire protection systems indicating pipe and fittings, cutting lengths, hydraulic calculations and node points, pipe sizes, locations, elevations, hangers, wall and floor penetrations and connections as well as all ceiling components noted previously. Include all information as required by NFPA 13, Item 14.1.3.

C. Submit shop drawings to the Design Engineer, Owners' Underwriter/Insurance Agency and to the local authority having jurisdiction for approval. Submit two (2) approved copies, bearing stamp and/or signature of the Fire Protection Engineer, Owners' Underwriter/Insurance Agency and of the local authority having jurisdiction before proceeding with fabrication and installation.

D. Submit "Contractor's Material and Test Certificates" upon completion of fire protection piping for all portions of work, which indicates that work has been installed and tested in accordance with all applicable sections of NFPA, and also that system is operational, complete, and has no defects.

E. At project closeout, submit record drawings of installed fire protection piping and products, in accordance with requirements of Section 23 0500, “Mechanical General”.

F. Submit maintenance data and parts list for fire protection materials and products. Include this data, all product data, shop drawings, approval drawings, approved calculations, certificate of installation, and record drawings in the Maintenance Manuals, and submit in accordance with the requirements of Section 23 0500, “Mechanical General”.

1.07 WATER SUPPLY:

A. For initial hydraulic calculation, refer to the water flow test data as shown on the Drawings. Upon award of Contract, Contractor shall verify the water flow test information by conducting a flow test as near as possible to site. A minimum of 5 psig must be accounted for as a safety factor for future fall off in the water supply.

B. In addition to the water flow test, a 24 hour chart recorder must be installed to a fire hydrant, or other water supply connection on site. All fluctuations in water pressure over a 24 hour period are to be recorded. The lowest recorded pressure shall be utilized as the maximum static pressure available for hydraulic calculations along with the appropriate safety factor being applied.

1.08 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction, including light fixtures, HVAC equipment, and partition assemblies, access platforms, etc. Coordinate routing of piping with structure and all other work.

1.09 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. Sprinkler Cabinets: Finished, wall mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.
2. Locate sprinkler cabinet where shown on Drawings or as directed by Owner.

PART 2 - PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match piping materials used in fire protection systems.

B. Where more than one type of material or product is indicated, selection is Installer's option, however, systems of piping must remain consistent in the type of materials and fittings utilized.

C. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 UNDERGROUND PIPE AND FITTINGS

A. Pipe: Class 52 ductile iron, ANSI A21.51

B. Fittings: Ductile iron mechanical joint, 250 lb., ANSI A21.10

C. Lining: Cement mortar lining for pipe and fittings, ANSI A21.4

D. Coating: Bituminous seal coating.

E. Joints: Push on gasketed joints ANSI A21.11 with neoprene gasket

2.03 STEEL PIPE AND FITTINGS

A. Schedule 10, Black Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13 specified wall thickness in NPS 6 to NPS 10, plain end.

B. Nonstandard OD, Thinwall Black Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, thinwall, with plain ends and wall thickness less than Schedule 10.

C. Malleable or Ductile Iron Unions: UL 860.

D. Cast Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.

E. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

F. Grooved Joint, Steel Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Anvil International, Inc.
   b. Shurjoint Piping Products.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
2. Pressure Rating: 250 psig minimum.
3. Galvanized and Uncoated, Grooved End Fittings for Steel Piping: ASTM A 47/A 47M, malleable iron casting or ASTM A 536, ductile iron casting; with dimensions matching steel pipe. Include ferrous housing sections, EPDM rubber gasket, and bolts and nuts.
4. Grooved End Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

G. Plain End Pipe Fittings: UL 213, ductile iron body with retainer lugs that require one quarter turn or screwed retainer pin to secure pipe in fitting.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anvil International, Inc.
   b. Shurjoint Piping Products.
   c. Victaulic Company
   d. Tyco Fire & Building Products LP

2.04 PIPING JOINING MATERIALS

A. Pipe Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast Iron and Class 150, Bronze Flat Face Flanges: Full face gaskets.
2. Class 250, Cast Iron and Class 300, Raised-Face Flanges: Ring type gaskets.

B. Metal, Pipe Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.05 LISTED FIRE PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating for Standard Pressure Piping: 175 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Anvil International, Inc.
   b. Victaulic Company.
2. Standard: UL 1091 except with ball instead of disc.
3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
5. Valves NPS 3: Ductile iron body with grooved ends.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. Anvil International, Inc.
   c. Clow Valve Company; a division of McWane, Inc.
   d. Crane Co.; Crane Valve Group; Crane Valves.
   e. Crane Co.; Crane Valve Group; Jenkins Valves.
   f. Crane Co.; Crane Valve Group; Stockham Division.
   g. Fire-End & Croker Corporation.
   h. Globe Fire Sprinkler Corporation.
   i. Kennedy Valve; a division of McWane, Inc.
   j. Metraflex, Inc.
   k. Milwaukee Valve Company.
   l. Mueller Co.; Water Products Division.
   m. NIBCO INC.
   n. Potter Roemer.
   o. Reliable Automatic Sprinkler Co., Inc.
   p. Shurjoint Piping Products.

q. Tyco Fire & Building Products LP.
r. Victaulic Company.
s. Viking Corporation.
t. Watts Water Technologies, Inc.

2. Standard: UL 312
3. Pressure Rating: 300 psig.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

D. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. American Valve, Inc.
   c. Clow Valve Company; a division of McWane, Inc.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Kennedy Valve; a division of McWane, Inc.
   f. Mueller Co.; Water Products Division.
   g. NIBCO INC.
   h. Tyco Fire & Building Products LP.
2. Standard: UL 262.
3. Pressure Rating: 300 psig.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

E. Wall Indicator:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. American Valve, Inc.
   c. Clow Valve Company; a division of McWane, Inc.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Kennedy Valve; a division of McWane, Inc.
   f. Mueller Co.; Water Products Division.
   g. NIBCO INC.
   h. Tyco Fire & Building Products LP.
2. Standard: UL 789.
3. Type: Wall post for mounting to riser valve.
4. Body Material: Cast iron.
5. Operation: Handwheel.

2.06 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Fire Protection Products, Inc.
   b. United Brass Works, Inc.
   c. Hammond Valve.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Anvil International, Inc.
   b. Conbraco Industries, Inc.; Apollo Valves.
   c. Croker Corporation.
   d. Jomar International, Ltd.
   e. Kennedy Valve; a division of McWane, Inc.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Potter Roemer.
   j. Red-White Valve Corporation.
   k. Tyco Fire & Building Products LP.
   l. Victaulic Company.
   m. Watts Water Technologies, Inc.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. United Brass Works, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Milwaukee Valve Company.

E. Plug Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Southern Manufacturing Group.
   b. Homestead Valve; a division of Olson Technologies, Inc.
   c. Milliken Valve Company.

F. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. AFAC Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.

2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.07 FIRE DEPARTMENT CONNECTIONS

A. Flush Type, Fire Department Connection:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Croker
   b. Elkhart Brass Mfg. Company, Inc.
   c. Guardian Fire Equipment, Inc.
   d. Potter Roemer.
2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back
13. Escutcheon Plate Marking: Similar to Auto Spkr & Standpipe
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 3.

2.08 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Anvil International, Inc.
   b. Shurjoint Piping Products.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical tee and cross fittings.
6. Configurations: Snap on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. AGF Manufacturing Inc.
   b. Triple R Specialty.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" listing or Factory Mutual "Approval Guide," listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast or ductile iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. CECA, LLC.
   b. Corcoran Piping System Co.
   c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Steel pipe with EPDM O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.09 AUTOMATIC SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire & Building Products LP.
4. Victaulic Company.
5. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Pendant type sprinkler heads located in offices and other spaces with ceilings shall be pendant type sprinkler.

D. Upright type rough brass heads shall be installed in areas without ceilings including all shell spaces.

E. Temperature rating of heads shall be selected in accordance with NFPA, the ambient room temperature and heat producing equipment.

F. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.
2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Fire Lite Alarms; a Honeywell company.
   b. Notifier; a Honeywell company.
   c. Potter Electric Signal Company.
2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 6 inch minimum diameter.
5. Finish: Red enamel factory finish, suitable for outdoor use.

C. Water Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. ADT Security Services, Inc.
   b. Grinnell
   c. McDonnell & Miller; ITT Industries.
   d. Potter Electric Signal Company.
   e. System Sensor; a Honeywell Company
   f. Viking Corporation.
   g. Watts Industries (Canada) Inc.
2. Standard: UL 346 and FM Approved.
3. Water Flow Detector: Electrically supervised.
4. Components: Two single pole, double throw circuit switches for isolated alarm and auxiliary contacts, 7A, 125-V ac and 0.25 A, 24-Vdc; complete with factory set, field adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig

7. Design Installation: Horizontal or Vertical

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   a. Fire Lite Alarms; a Honeywell company.
   b. Grinnell
   c. Kennedy Valve; a division of McWane, Inc.
   d. Potter Electric Signal Company.
   e. System Sensor; a Honeywell company.
2. Standard: UL 346 and FM approved.
3. Type: Electrically supervised.
4. Components: Two sets of single pole, double throw switches with normally closed contacts, for AC or DC operation, with tamper proof cover, bracket and J-bolts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. AMETEK, Inc.; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. Drwyer
5. Weiss

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 300 psig.

2.12 ANCHORAGES

A. Clamps, Straps and Washers: Steel, ASTM A-506.

B. Rods: Steel, ASTM A-575.

C. Rod Couplings: Malleable iron, ASTM A-197.

D. Bolts: Steel, ASTM A-307.

E. Cast Iron Washers: ASTM A-126, Class A.

F. Thrust Blocks: 2500 psi concrete.

PART 3 - EXECUTION

3.01 SERVICE ENTRANCE PIPING

A. Connect sprinkler piping to water service piping for service entrance to building.

3.02 SPRINKLER HEADS

A. Unless otherwise noted on Drawings, sprinkler heads shall be rated for 155 or 165 degrees F.

B. Provide basket type guards over sprinkler heads in all areas where head is less than 7'-0" above finished floor, to protect them from damage.

C. Sprinkler heads shall be provided below all ductwork, suspended piping and equipment, platforms and all other obstructions greater than 4'-0" in width.

D. All sprinkler heads shall be centered in acoustical ceiling tiles.

E. Provide shields on all sprinklers located near electric panels to limit the sprinkler discharge on the panels.

F. Install sprinkler heads so that heads are located no closer than 1' – 0" to lights, diffusers, or other obstructions.

G. Provide to the representative of the Owner a reserve supply of sprinkler heads minimum and the tools for removing and replacing the heads. Types of heads shall include a minimum of six (6) of each. The heads and tools shall be contained in a metal carrying case.

3.03 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. The fire protection system shall include all NFPA specified accessories including signs, test connections and drains.

C. Comply with requirements of NFPA 13 for installation of fire protection piping materials. Install piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that piping systems comply with requirements and serve intended purposes.

D. Coordinate with other work, including ductwork and HVAC and plumbing piping, as necessary to interface components of fire protection piping properly with other work.

E. Fire mains, crossmains, and branch piping shall not be installed inside or above the ceiling of Electrical Equipment Rooms, Communication Rooms or other rooms of similar usage. Only sprinkler branch piping which serves sprinklers located inside such rooms shall be permitted to be installed within room. Do not run piping directly above electrical panels and equipment.

F. Coordinate the quantity and the location of all supervised valves and waterflow switches with the Fire Alarm Installer. Insure that all valve switches and waterflow switches not shown on Drawings, but required by the local authority having jurisdiction, have been located and wired to the alarm panel by the Fire Alarm Installer.

G. Waterflow indicators shall be mounted horizontally or vertically on top of pipe. Adjust retard to provide maximum of 30 second delay. Schedule 40 pipe must be provided for waterflow indicator.

H. O.S & Y. valve stem shall be carefully filed to accommodate stem of valve switch.

I. All areas which have ceilings shall have sprinkler piping concealed above ceilings.

J. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

3.04 DRAINS

A. Install sprinkler piping with drains for complete system drainage.

B. All trapped sprinkler piping shall be provided with drain valves and shall be routed to and discharged over the nearest suitable floor drain, hub drain or service sink unless shown or noted otherwise on Drawings. Drain valve shall be located at the point of discharge.

C. Install automatic ball drip drain valve to drain the piping between the check valve and the fire department connection. Drain to floor drain or to outside of building.

D. Where floor drains or service sinks are not available or suitable for the discharge of the sprinkler drains, the drain shall be routed to the exterior and discharged on grade. Location of the drain must be approved by Architect.

E. The location of all drains, routings and terminations shall be shown on the shop drawings.

F. All drains and inspector’s test connections located on exterior walls shall be painted to match exterior and penetration shall be sealed and provided with chrome plated escutcheon secured to wall. Paint escutcheon at the direction of the Architect.

3.05 HANGERS AND SUPPORTS

A. The installation of all hangers and supports shall comply with NFPA 13.

B. All sprinkler piping shall be independently supported from other piping and duct systems. All piping, including drain piping shall be rigidly supported.

C. Where grooved couplings and / or other systems of mechanical fittings and couplings are utilized for fastening, sufficient number of hangers must be provided to prevent any sagging or misalignment of piping.

3.03 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. 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.

H. Twist Locked Joints: Insert plain end of steel pipe into plain end pipe fitting. Rotate retainer lugs one quarter turn or tighten retainer pin.

I. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized steel pipe.

J. Steel Piping, Cut-Grooved Joints: Cut square edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

K. Steel Piping, Roll Grooved Joints: Roll rounded edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel pipe grooved joints.

3.04 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire protection shutoff valves supervised open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.05 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall type, fire department connections.

B. Install automatic ball drip drain valve at each check valve for fire department connection.

3.06 WET PIPE SPRINKLER RISER

A. Provide wet pipe sprinkler control valve at all wet pipe sprinkler riser at the location indicated on the Contract Drawings.

B. Provide sprinkler control valve with alarm check valve, supervisory tamper switch, waterflow switch, inspector's test and drain valve, pressure gauges, retard chamber, water motor alarm gong and all standard trim.

3.07 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping including control valves, sectional valves, alarm valves, dry pipe valves, inspectors test connections, auxiliary drains, drain valves, etc. according to requirements in NFPA 13 and Section 23 0553 "Identification".

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

C. Access panels provided for valves concealed above ceilings or inside partitions must be provided with permanently attached signs identifying control valve or drain.

3.08 ANCHORAGES

A. General: Provide concrete thrust block anchorages for underground tees, plugs, caps and bends in accordance with NFPA No. 24. Provide rods and clamps on fittings located underground inside building as shown on Drawings.

B. After installation, apply a full coat of asphalt or other acceptable corrosion retarding material to surfaces of rods and clamps.

3.09 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for a period of 2 hours, at not less than 200 psi. Check system for leakage at joints. Measure hydrostatic pressure at low point of each system or zone being tested. Any drop in pressure will not be permitted.
2. Repair or replace piping systems as required to eliminate leakage in accordance with NFPA standards and retest as specified to demonstrate compliance and to satisfaction of the Engineer and Owner.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

4. Sprinkler Piping Flushing: Prior to connecting sprinkler piping for flushing, flush water feed mains, lead in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system as required to remove foreign substances. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers. Provide test connections on sprinkler mains, crossmains and large branch piping to permit flushing.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
6. Energize circuits to electrical equipment and devices.
7. Coordinate with fire alarm tests. Operate as required.
8. Verify that equipment hose threads are same as local fire department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 CLEANING

A. Remove bags and clean dirt and debris from sprinklers.

B. Remove and replace sprinklers that have received paint other than factory finish.

END OF SECTION

SECTION 22 05 70 TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. This Section includes all work associated with the installation of underground piping including but not necessarily limited to:

1. Trench Excavation
2. Sheeting and/or Shoring
3. Dewatering
4. Pipe Bedding
5. Pipe Installation
6. Backfill
7. Compaction

1.03 QUALITY ASSURANCE:

A. Work shall be performed by qualified firms with at least three (3) years of successful installation experience.

1.04 DEFINITIONS:

A. Backfill: Soil material used to fill a utility trench excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe, to a point 12 inches above top of pipe.
2. Final Backfill: Backfill placed in layers and compacted over the initial backfill to fill a utility trench to subgrade elevation.

B. Bedding Material: Granular aggregate layer placed over the excavated subgrade in a trench prior to the installation of pipe.

C. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits and boulders of rock material 3/4 cu.yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Granular Bedding Material:

1. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
2. Sand: ASTM C 33; fine aggregate

B. Select Backfill Material:

1. Granular Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

C. Common Backfill Material:

1. Common backfill shall consist of previously excavated mineral soil, free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material which may be compressible or which cannot be compacted properly. Common backfill shall not contain stones larger than two (2) inches in any dimension, broken concrete, masonry, rubble, or other similar objectionable materials. It shall have physical properties such that it can be readily deposited and compacted during backfilling.
2. Common backfill material, falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the Owner's Representative, is not suitable for reuse shall be disposed of as specified herein for disposal of unsuitable materials.

PART 3 – EXECUTION

3.01 GENERAL:

A. The work of this Section is defined to include whatever excavating and backfilling is necessary to install the mechanical work. Coordinate the work with other excavating and backfilling operations in the same area, including dewatering, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services (existing and new), landscape development, paving, foundations and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling operations.

B. Excavation: Excavate to bottom of trench elevations regardless of the character of surface and subsurface conditions encountered. Excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials. Owner's geotechnical soil testing agency shall determine acceptability of excavated material.
2. Remove rock to elevations required to permit installation of permanent construction without exceeding the following dimensions:
   a. Six (6) inches beneath bottom of pipe in trenches, and no greater than 24 inches wider than pipe.
3. Explosives: The use of explosives to move rock excavation will not be permitted.

C. DISPOSAL OF MATERIALS:

1. Excavated material shall be stacked without excessive surcharge near the trench bank. Inconvenience to traffic shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.
2. Surplus excavated material which is suitable for use in backfilling shall be stockpiled. Unsatisfactory surplus material shall be disposed of.

3. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of by the Contractor except as directed by the Owner's Representative.
4. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored. When required, it shall be rehandled and used in backfilling the trench. This shall be done without any additional cost to the Contract.

D. SHEETING AND BRACING:

1. Furnish, put in place and maintain sheeting and bracing required to support the sides of the excavation and prevent loss of ground which could damage or delay the work or endanger adjacent structures. Care shall be taken to prevent voids outside of the sheeting; however, if voids are formed, they shall be immediately filled and rammed.

E. DRAINAGE:

1. The Contractor shall furnish all materials and equipment and perform all incidental work required to install and maintain the drainage system he proposes for handling ground water or surface water encountered. Construction shall not begin until the Owner's representative is assured that the proposed method will be satisfactory. Excavations must have a stable subgrade. The Contractor must alter his drainage methods if in the opinion of the Owner's Representative the trench bottom is unsatisfactory, until excavation is in acceptable condition.
2. Provide pumping equipment and devices to properly remove and dispose of all water entering trench and excavation for structures. The grade shall be maintained acceptably dry until structures to be built therein are completed. All drainage shall be performed without damage to the trench, pavements, pipes or other utilities. Water must be disposed of in a manner acceptable to the Owner's Representative and the local authority having jurisdiction.
3. Grade the top of trenches as required to prevent surface water from flowing into trenches.
4. Pipe shall not be laid in water or allowed to become submerged prior to backfilling.

F. TRENCH EXCAVATION:

1. Make excavations to the depth as required by the Drawings and in such a manner and to such minimum widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting, and for pumping and drainage facilities; and render the bottom of the excavations firm and dry in all respects.
2. Trench width shall be kept to the minimum required for the proper installation of the required pipe size.
3. Sides of the trenches shall be vertical to a point not less than twelve inches (12") above the top of pipe.
4. The trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
5. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. The last of the material being excavated shall be done manually, and shall be done in such a manner that it will give a flat bottom, true to grade so that pipe or duct can be evenly supported on undisturbed material. Bell holes shall be made as required to accommodate the installation of the pipe.
6. Where bedding material is to be provided, excavate bottom of trenches to a depth of four inches (4") below the bottom of the pipe for the bedding material.

7. Rock, when encountered, shall be removed to a minimum of eight inches (8") clearance around the bottom and sides of the pipe being laid.

G. PIPE BEDDING:

1. The Contractor shall furnish and install pipe on the type of bedding shown on the Drawings or as specified herein. Regardless of the type of bedding used, holes in the trench shall be provided to receive the pipe bell. The hole excavated shall be sufficient to relieve pipe bells of all loads and shall provide support over the total length of the pipe barrel. Carefully prepare the bedding so that the pipe, after installation, will be true to line and grade.
2. Pipe Bedding Classifications:
   a. Class D-1 Bedding:
      1) For Class D-1 bedding, the trench bottom shall be hand shaped to provide holes to receive the pipe bell. The hole excavated shall be sufficient to relieve the pipe bells of all loads and shall permit the trench bottom to provide support along the entire length of the pipe barrel. The bottom of the trench must be graded so that the pipe will be true to line and grade.
      2) Class D-1 pipe bedding may be used for cast iron, ductile iron and copper tube pressure piping only.
   b. Class C-1 Bedding:
      1) For Class C-1 bedding, granular bedding material shall be compacted in the trench bottom to provide a minimum thickness of four inches (4") below the bottom of the pipe.
      2) The bedding material shall then be shaped by hand to the contour of the pipe barrel. Bell holes shall be provided for the pipe bells, to insure that loads are not transmitted to the pipe bells.
      3) Sufficient bedding material shall be used to provide a depth of one-sixth (1/6) of the pipe outside diameter.
      4) Where the trench bottom has been over excavated below the required grade, Class C-1 bedding shall be used.
   c. Class C-2 Bedding:
      1) For Class C-2 bedding, the bottom of the trench shall be undisturbed and shall be hand shaped to provide continuous contoured support along the entire length of the pipe, for a minimum of 50% of the pipe barrel. Bell holes shall be provided at all pipe bells insure that loads are not transmitted to pipe bells.
      2) Class C-2 bedding shall be used for rigid cast iron, ductile iron or concrete gravity drainage piping.
   d. Class B-1 Bedding:
      1) For Class B-1 bedding, granular bedding material shall be compacted in the trench bottom to provide a minimum thickness of four inches (4") below the bottom of the pipe.
      2) The bedding material shall then be shaped by hand to the contour of the pipe barrel. Bell holes shall be provided for the pipe bells, to insure that no loads are transmitted to the pipe bells.
      3) Sufficient bedding material shall be used to provide a depth of material equal to the springline of the pipe.
      4) Where rock has been excavated from the trench bottom, Class B-1 bedding shall be used, and a minimum bedding thickness of eight inches (8") shall be provided.
      5) Class B-1 bedding shall be used where increased pipe load bearing strength is required and where specifically noted on Drawings.

e. Class B-2 Bedding:
   1) For Class B-2 bedding, sand or granular bedding material shall be utilized as the bedding material, and shall be compacted in the trench bottom to provide a minimum thickness of four inches (4") below the bottom of the pipe.
   2) The bedding material shall then be shaped by hand to the contour of the pipe barrel. Bell holes shall be provided for the pipe bells to insure that no loads are transmitted to the pipe bells.
   3) Place and consolidate additional bedding material, by hand, under the pipe haunch to provide adequate side support to avoid vertical and horizontal displacement of the pipe up to the springline of the pipe.
   4) Additional bedding material shall be placed in 8” lifts and hand tamped to a depth of twelve inches (12") above the top of the pipe.
   5) Installation shall conform to the requirements of ASTM D-2321.
   6) Class B-2 bedding shall be used for all thermoplastic pressure and gravity drainage piping including but not limited to PVC, CPVC and ABS pipe materials.

f. Class A-1 Bedding:
   1) For Class A-1 bedding, granular bedding material shall be compacted in the trench bottom to provide a minimum thickness of four inches (4") below the bottom of the pipe.
   2) The bedding material shall then be shaped by hand to the contour of the pipe barrel. Bell holes shall be provided for the pipe bells to insure that no loads are transmitted to the pipe bells.
   3) Place and consolidate additional bedding material, by hand, under the pipe haunch to provide adequate side support to avoid vertical and horizontal displacement of the pipe up to the springline of the pipe.
   4) After the bedding material has been compacted to the springline of the pipe, pour lean concrete mix, 2000 psi minimum, the full width of the trench, to a depth of six inches (6") above the top of the pipe. Concrete must be cured and protected from injury, due to construction and weather prior to subsequent backfilling operations.
   5) Class A-1 bedding shall be used at locations as indicated on Drawings.

3.02 PIPE INSTALLATION:

A. All piping shall be laid accurately to line and grade by the use of lasers, batter boards (spaced not more than 25' apart), or plumb lines. Three (3) consecutive batter boards shall be in place at all times when installing pipe. When necessary, deflect pipe at joints. Deflection shall not exceed manufacturer's recommendations.

B. Prior to making joints, all surfaces of the pipe joint and jointing materials shall be cleaned and dried. Lubricants, primer, and adhesives shall be used as recommended by the pipe or joint manufacturer. Joints shall then be made in an approved workmanlike manner to obtain a water-tight joint. Trenches shall be kept free of water during bedding, pipe laying, jointing and backfilling.

C. After pipe has been installed, installation shall be inspected by Owner’s Representative and local authority having jurisdiction.

D. After pipe installation, system shall be tested in accordance with the specific material specification for the system installed. Trench backfilling shall not proceed until system has passed testing requirements.

3.03 TRENCH BACKFILLING:

A. As soon as practicable after the pipe has been laid, jointed, inspected and tested, trench backfilling shall begin and completion shall be expedited.

B. After the required bedding has been placed, or after the required pipe has been properly bedded on a shaped trench bottom, backfill material, as required by the class of bedding required, free from stones and other foreign material shall be placed to a depth of twelve inches (12") over the top of the pipe. Backfill shall be placed in eight inch (8") lifts and shall be thoroughly compacted by hand tamping as placed.

C. Any remaining space or voids between the pipe and the side of the trench shall be packed full by hand shovel with granular bedding material or excavated material, free from stones having a diameter greater than two inches (2"), and thoroughly compacted with a tamper, as placed up to a level of twelve inches (12") above the top of the pipe.

D. The backfilling shall be carried up evenly on both sides of the pipe with continuous tamping.

E. Backfill shall be placed in eight inch (8") lifts to a point twelve inches (12”) above the top of pipe, to obtain the compaction required.

F. The remainder of the trench above the compacted backfill, twelve inches (12”) above the top of pipe, shall be back filled with satisfactory excavated material and thoroughly compacted by rolling or tamping. All trench compaction shall be at least 95% of its maximum dry density as determined by the Standard Proctor Test, ASTM D-698.

3.04 TRENCH COMPACTION

A. Owner’s Soil Testing Agency shall perform compaction tests on each lift of backfill. One test to be performed on each l50 lineal feet of trench. Backfill which does not conform to compaction requirements shall be recompacted until desired results are obtained.

3.05 RESTORATION OF DISTURBED SURFACES:

A. Where it is necessary to remove and replace landscape work, pavement, sidewalks, flooring, and similar exposed finish work, engage the original installer to install the replacement work; except where the work existed prior to the work of this Contract. Engage only experienced and expert firms and tradespersons to replace the work.

3.06 DISPOSAL OF SURPLUS AND WASTE MATERIALS:

A. Promptly remove all discarded or unused materials, trash, debris and unsatisfactory soil materials and legally dispose of it off the Owner's property. Satisfactory excess excavated material shall be disposed of as directed by the Owner's Representative.

END OF SECTION

SECTION 22 11 16 DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Flexible connectors.
3. Escutcheons.

B. Related Sections include:

1. 22 0500 Trench Excavation and Backfill
2. 23 0500 Mechanical General
3. 23 0511 Mechanical Submittals
4. 23 0529 Hangers and Supports
5. 23 0553 Identification
6. 23 0523 Valves
7. 23 0713 Thermal Insulation for Mechanical Systems

1.03 SUBMITTALS

A. Refer to Section 23 0511 for required submittals.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.01 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.

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type Land water tube, drawn temper.

1. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
3. 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.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch 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.

2.04 SPECIALTY VALVES

A. Comply with requirements in Section 23 0523 " Valves " for general-duty metal valves.

2.05 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. Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products.
2. Description:
   a. Pressure Rating: 150 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Couplings:

1. Subject to compliance with requirements, provide products by one of the following:
   a. Calpico, Inc.
   b. Lochinvar Corporation.
   c. Custom Manufacturer.
   d. Johnson Screens.
2. Description:
   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

D. Dielectric Nipples:

1. Subject to compliance with requirements, provide products by one of the following:
   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Company.
2. Description:
   a. Electroplated steel nipple complying with ASTM F 1545.
   b. Pressure Rating: 300 psig at 225 deg F
   c. End Connections: Male threaded or grooved.
   d. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Comply with requirements in Section 22 0570 "Trench, Excavation and Backfill" for excavating, trenching, and backfilling.

3.02 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 according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. 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.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

3.03 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. 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."

3.04 VALVE INSTALLATION

A. 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 or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

B. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

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.

3.05 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.06 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits, and nipples.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.07 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.08 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 15 Section "Hangers and Supports" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
   a. MSS Type 1, adjustable, steel clevis hangers.

B. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.

3.09 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 fixture Sections 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 and larger.

3.10 IDENTIFICATION

A. Identify system components. Comply with requirements in Section 23 0553 "Identification" for identification materials and installation.

3.11 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 covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig 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.

3.12 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 CLEANING

A. Clean and disinfect potable and non-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 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 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. Fitting Option: Extruded-tee connections may be used on aboveground copper tubing.

C. Underground domestic water piping shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping shall be the following:

1. Hard copper tube, ASTM B 88, Type L 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 or gate valves for piping.
2. Throttling Duty: Use ball or globe valves.
3. Hot-Water Circulation Piping: Use ball valve.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 13 16 SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.

B. Related Sections include:

1. 22 1319 Drains, Cleanouts and Drainage Accessories
2. 22 0500 Trench Excavation and Backfill
3. 23 0500 Mechanical General
4. 23 0511 Mechanical Submittals
5. 23 0529 Hangers and Supports
6. 23 0553 Identification

1.03 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

1.04 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified..

2.02 PIPING MATERIALS

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

2.03 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.04 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. 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. Manufacturers:
      1) ANACO.
      2) Fernco, Inc.
      3) Ideal Div.; Stant Corp.
      4) Mission Rubber Co.
      5) Tyler Pipe; Soil Pipe Div.

2.05 COPPER TUBE AND FITTINGS

A. 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.

B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

C. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Section 22 0510 "Trench, Excavation and Backfill" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste and vent piping shall be the following:

1. Hubless cast-iron soil pipe and fittings and sovent stack fittings; and couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.
3. Dissimilar Pipe-Material Couplings: Flexible, unshielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Underground, soil, waste, and vent piping shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Flexible, unshielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.03 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Section 23 0500 "Mechanical General."

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

D. 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."

E. 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 drain pipe. 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.

F. 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.

G. 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 and smaller; 1 percent downward in direction of flow for piping NPS 4 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.

H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.04 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. 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.

3.05 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Section 23 0529 "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
   a. MSS Type 1, adjustable, steel clevis hangers.

B. 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: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

C. Install supports for vertical cast-iron soil piping every 15 feet.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. 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. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.07 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 or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.08 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.

END OF SECTION

SECTION 22 13 19 DRAINS, CLEANOUTS AND DRAINAGE ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. All work specified in this section is subject to the provisions of Section 23 0500, "Mechanical General."

B. Refer to the following sections for related work in connection with drains, cleanouts and drainage accessories.

1. 23 05 11 Mechanical Submittals
2. 22 13 16 Soil, Waste and Vent Piping

1.02 DESCRIPTION OF WORK:

A. The number, type and size of the drains and cleanouts are indicated on the Drawings and shall include the following:

1. Floor Drains
2. Cleanouts

1.03 QUALITY ASSURANCE:

A. Manufacturing firms shall be regularly engaged in the manufacture of plumbing products of type and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Subject to compliance with requirements, provide drains, cleanouts & drainage accessories of one of the following manufacturers:

1. Ancon, Inc.
2. Josam Company
3. Jay R. Smith Mfg. Co.
4. Wade Div., Tyler Pipe
5. Zurn Industries, Inc.

PART 2 - PRODUCTS

2.01 FLOOR DRAINS:

A. General: Provide floor drains of size and type as indicated on the Drawings, including features as specified herein. Floor drains and floor sinks located on floors above the ground floor shall be provided with flashing clamps.

B. Floor Drain Type "G": Cast iron body and reversible flashing collar, nickel bronze adjustable with 6 x 6 square or 6 inch diameter secured strainer top, equal to Jay R. Smith 2010-B Series.

C. Floor Drain Type "M": Cast iron deep body with flange and 12 inch diameter heavy duty cast iron tractor grate, equal to Jay R. Smith 2141 Series.

D. Floor Drain Type "MB": Cast iron deep body with flange and 12 inch diameter heavy duty ductile iron grate, loose set sediment bucket, equal to Jay R. Smith 2233 Series.

E. Hub Drains Type "HD": Cast iron pipe hub set in floor with top 1 inch above the finished floor. The indirect waste line run to the hub drain shall stop 2 inch above the top of the hub.

F. All floor drains without trap primer connections shall be provided with deep seal "P" traps.

G. Floor drains where indicated on Drawings shall be provided with trap primer connections.

2.02 CLEANOUTS:

A. Floor Cleanouts shall have a cast iron body with frame, cleanout plug and adjustable top as follows:

1. Nickel-Bronze Top: Manufacturers standard cast unit of the pattern indicated:
   a. Pattern: Exposed round (square) rim type, with recess to receive 1/8 inch thick resilient floor finish, equal to J. R. Smith 4140 (4160).
   b. Pattern: Exposed finish type, standard mill finish to be covered with carpet and located with carpet marker, equal to J. R. Smith 4020-Y.
   c. Pattern: Exposed flush type, standard non-slip scored or abrasive finish, equal to J. R. Smith 4020.
2. Heavy duty, round, cast iron top shall be used for all unfinished areas with concrete slabs, equal to J. R. Smith 4240.
3. Heavy duty, round, cast iron tractor top shall be used for location in Work Bays and exterior locations in pavement, equal to J. R. Smith 4240.

PART 3 - EXECUTION

3.01 EXECUTION:

A. All floor drain strainers shall be securely fastened to drain body.

B. During construction drains shall be kept covered so that traps and sediment buckets are kept free from debris, trash and sediment. All traps and buckets shall be cleaned of all debris prior to acceptance by Owner.

C. All floor drains and cleanouts shall have finishes protected from damage during construction. All tops and surfaces damaged during construction shall be replaced prior to acceptance by Owner.

D. All floor drain and cleanout covers deformed by heavy construction traffic shall be replaced.

END OF SECTION

SECTION 22 15 13 COMPRESSED AIR PIPING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes piping and related specialties for general service compressed air piping systems.

B. Related Sections include the following:

1. Section 22 15 19 “Air Compressors and Receivers”.
2. Section 23 05 00 “Mechanical General”.
3. Section 23 05 11 “Mechanical Submittals”.
4. Section 23 05 29 “Hangers and Supports”.
5. Section 23 05 23 “Valves”.
6. Section 23 05 53 “Identification”.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Piping, fittings, and valves.
2. Dielectric fittings.
3. Flexible pipe connectors.
4. Safety valves.
5. Pressure regulators.
6. Automatic drain valves.
7. Filters.
8. Lubricators.
9. Quick couplings.
10. Hose reels and assemblies.

B. Brazing and welding certificates.

C. Qualification Data: For Installers.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For general service compressed air piping specialties to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Installation contracting firm shall have at least five (5) years of successful installation experience on projects with compressed air piping systems work similar to that required for project.

B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. ASME Compliance:

1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed air piping.

E. Manufacturing firms shall be regularly engaged in the manufacture of compressed air piping system products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

PART 2 - PRODUCTS

2.01 COMPRESSED AIR PIPING MATERIALS AND PRODCUTS:

A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in compressed air piping systems.

B. Where more than one type of material or product is indicated, selection is Installer's option, however systems of piping must remain consistent in the type of materials and fittings utilized.

C. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.

1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
7. Grooved-End Fittings and Couplings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Anvil International, Inc.
      2) Star Pipe Products; Star Fittings Div.
      3) Victaulic Company.
      4) Ward Manufacturing, Inc.
   b. Grooved-End Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron casting; with grooves according to AWWA C606 and dimensions matching steel pipe.

c. Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for 300 psig minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oil-free compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.

2.02 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed air piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.03 VALVES

A. Metal Ball, Butterfly, Check, Gate, and Globe Valves: Comply with requirements in Section 23 0523 "Valves".

2.04 DIELECTRIC FITTINGS

A. General Requirements for Dielectric Fittings: Combination fitting of copper alloy and ferrous materials with insulating material; suitable for system fluid, pressure, and temperature. Include threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. EPCO Sales, Inc.
   c. Watts Water Technologies, Inc.; Water Products Div.
   d. Zurn Plumbing Products Group; Wilkins Div.

2.05 FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Hyspan Precision Products, Inc.
4. Mercer Rubber Co.
5. Metraflex, Inc.
6. Proco Products, Inc.
7. Unaflex, Inc.
8. Universal Metal Hose; a Hyspan Company

B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.

2.06 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.

1. Type: Pilot operated.

C. Air Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.

D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 250-psig minimum working pressure, capable of automatic discharge of collected condensate.

2.07 FILTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Balston
2. Deltech
3. Donaldson
4. Hankison
5. Huntsman
6. Ingersoll Rand
7. Kaeser Compressors, Inc.

B. Pre-Filters: Two-stage, mechanical-separation-type, air line filters with cast aluminum or steel housing constructed in accordance with ASME Code for 200 psi. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock.

C. Coalescing Filters: With cast aluminum or steel housing constructed in accordance with ASME Code for 200 psi. Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded.

2.08 FILTER-REGULATOR-LUBRICATOR UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Balston
2. Deltech
3. Donaldson
4. Hankison
5. Huntsman
6. Ingersoll Rand
7. Kaeser Compressors, Inc.

B. Filter: Compressed air filter with aluminum bowl and filter body, maximum inlet pressure 250 psig with automatic moisture drain, 5 micron standard filter, 1/8 inch port.

C. Air Line Pressure Regulators: Diaphragm operated, aluminum alloy or plastic body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig maximum inlet pressure with standard knob control, 1/8 inch port.

D. Air Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Aluminum body, 250-psi maximum pressure, 1/8 inch port.

1. Provide with automatic feed device for supplying oil to lubricator.

E. Basis of Design: Ingersoll Rand ARC Model C38121-820.

2.09 QUICK COUPLINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aeroquip Corporation; Eaton Corp.
2. Bowes Manufacturing Inc.
3. Foster Manufacturing, Inc.
4. Milton Industries, Inc.
5. Parker Hannifin Corp.; Fluid Connectors Group; Quick Coupling Div.
6. Rectus Corp.
7. Schrader-Bridgeport; Amflo Div.
8. Schrader-Bridgeport/Standard Thomson.
9. Snap-Tite, Inc.; Quick Disconnect & Valve Division.
10. TOMCO Products Inc.
11. Tuthill Corporation; Hansen Coupling Div.

B. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

C. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
2. Plug End: Flow-sensor-bleeder, check-valve(s) or straight-through type with barbed outlet for attaching hose.

D. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
2. Plug End: With barbed outlet for attaching hose.

2.10 HOSE REEL ASSEMBLIES

A. Description: Compatible hose reel, hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig minimum working pressure, unless otherwise indicated.

1. Hose: Fifty (50) foot length, 1/2 inch diameter reinforced single- or double-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless-steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.
5. Hose Stop: Hose stop for 1/2 inch diameter hose with a four-way roller assembly.
6. Hose Reel: Single hose with heavy-duty spring rewind reel with 180 degree swivel mounting base.

7. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hubbell
   b. Ingersoll Rand
   c. Reelcraft
8. Basis of Design: Ingersoll Rand Model CCN: 38032934 with CCN: 38343620 hose stop.

2.11 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Compressed Air Distribution Piping: Use one of the following piping materials for each size range:
   1. NPS 2 and Smaller: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
   2. NPS 2 and Smaller: Type K or L, copper tube; wrought-copper fittings; and brazed joints.

B. Drain Piping: Use one of the following piping materials:

   1. NPS 2 and Smaller: Type L hard copper tube; wrought-copper fittings; and brazed or soldered joints.

3.02 VALVE APPLICATIONS

A. General-Duty Valves: Comply with requirements in Section 15 0523 "Valves" for metal general-duty valves. Use metal valves, unless otherwise indicated.

   1. Metal General-Duty Valves: Use valve types specified in "Valve Applications" Article in Section 15 0523 "Valves" according to the following:
      a. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
      b. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
      c. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
      d. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.03 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. 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 otherwise indicated.

C. Install piping adjacent to equipment and machines to allow service and maintenance.

D. Install air and drain piping with a slope of 1/16 inch per foot downward in direction of flow or as shown on Drawings.

E. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

F. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.
2. Use cast-copper-alloy companion flange with gasket and brazed or soldered joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

G. Flanged joints may be used instead of specified joint for any piping or tubing system.

H. Install eccentric reducers where compressed air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

I. Install branch connections to compressed air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

J. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver.

K. Install piping to permit valve servicing.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Provide a manual valved bypass around all automatic drains at compressed air equipment to permit the automatic drain to be bypassed.

3.04 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 pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
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.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

G. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.05 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 23 0523 "Valves."

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.06 DIELECTRIC FITTING INSTALLATION

A. Install dielectric unions in piping at connections of dissimilar metal piping and tubing.

3.07 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping of each air compressor.

B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.08 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air main pressure regulators in compressed air piping at or near air compressors.

C. Install air line pressure regulators in branch piping to equipment.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install coalescing filters in compressed air piping at or near air compressors and upstream from mechanical filters.

F. Install mechanical filters in compressed air piping at or near air compressors and downstream from coalescing filters.

G. Install air line lubricators in branch piping to machine tools.

H. Install quick couplings at piping terminals for hose connections.

I. Install hose assemblies at hose connections.

3.09 CONNECTIONS

A. Install unions in piping adjacent to each valve and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements Section 23 0511 "Hangers and Supports" for pipe hanger and support devices.

B. Vertical Piping: MSS Type 8 or 42, clamps.

C. Individual, Straight, Horizontal Piping Runs:

1. MSS Type 1, adjustable, steel clevis hangers.

D. Support horizontal piping within 12 inches of each fitting and coupling.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 to NPS 1/2: 5 feet with 3/8-inch rod.
2. NPS 3/4 to NPS 1-1/4: 7 feet with 3/8-inch rod.
3. NPS 1-1/2: 12 feet with 3/8-inch rod.
4. NPS 2: 13 feet with 3/8-inch rod.
5. NPS 2-1/2: 14 feet with 1/2-inch rod.

G. Install supports for vertical, Schedule 40, steel piping every 15 feet.

H. Install hangers for Schedule 5, steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/2: 6 feet with 3/8-inch rod.
2. NPS 3/4: 7 feet with 3/8-inch rod.
3. NPS 1: 8 feet with 3/8-inch rod.
4. NPS 1-1/4: 9 feet with 3/8-inch rod.
5. NPS 1-1/2: 10 feet with 3/8-inch rod.
6. NPS 2: 11 feet with 3/8-inch rod.

I. Install supports for vertical, Schedule 5, steel piping every 10 feet.

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4: 5 feet with 3/8-inch rod.
2. NPS 3/8 and NPS 1/2: 6 feet with 3/8-inch rod.
3. NPS 3/4: 7 feet with 3/8-inch rod.
4. NPS 1: 8 feet with 3/8-inch rod.
5. NPS 1-1/4: 9 feet with 3/8-inch rod.
6. NPS 1-1/2: 10 feet with 3/8-inch rod.
7. NPS 2: 11 feet with 3/8-inch rod.

K. Install supports for vertical copper tubing every 10 feet.

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for compressed air piping, valves, and specialties. Comply with requirements in Section 23 0553 “Identification.”

3.12 CLEANING

A. Drain and clean all dirt pockets, strainers, filters and drain legs.

B. Thoroughly air blow all compressed air piping.

3.13 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 250 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure after air temperature has stabilized.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters, lubricators and pressure regulators for proper operation.

C. Tests of all systems shall be witnessed by Engineer and Owner. Ample notice of the performance of test must be given by the Contractor to the Engineer and Owner.

D. Submit certification of all test reports to Owner.

END OF SECTION

SECTION 22 15 19 AIR COMPRESSORS AND RECEIVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section includes the following equipment:

1. Lubricated, reciprocating air compressors.
2. Receivers.
3. Concrete equipment pads.
4. Refrigerant air dryers.
5. Accessories.

B. Related Sections include the following:

1. Section 23 05 00 “Mechanical General”.
2. Section 23 05 11 “Mechanical Submittals”.
3. Section 23 05 53 “Identification”.
4. Section 23 15 13 “Compressed Air Piping System”.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Wiring Diagrams: For power, signal, and control wiring.

B. Delegated-Design Submittal: For compressed-air equipment mounting 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. Detail fabrication and assembly of supports.

C. Operation and Maintenance Data: For compressed-air equipment to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Manufacturing firms shall be regularly engaged in the manufacture of tank mounted air compressors of type and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ASME Compliance: Fabricate and label receivers to comply with ASME Boiler and Pressure Vessel Code, and shall bear ASME Code Symbol.

1.05 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.06 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. Air-Compressor, Inlet-Air-Filter Elements: One replacement filter for each filter installed.
2. Belts: One for each belt-driven compressor.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PACKAGED AIR COMPRESSORS AND RECEIVERS

A. General Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.

B. All equipment shall be of the same manufacturer.

C. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.

1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
2. Motor Controllers: Full-voltage, combination magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
3. Control Voltage: 120-V ac or less, using integral control power transformer.
4. Motor Overload Protection: Overload relay in each phase.
5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
6. Automatic control switches to alternate lead-lag compressors for duplex air compressors.
7. Instrumentation: Include discharge-air pressure gage, air-filter maintenance indicator, hour meter, compressor discharge-air and coolant temperature gages, and control transformer.
8. Alarm Signal Device: For connection to alarm system to indicate when backup air compressor is operating.

D. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected compressors, and bearing appropriate code symbols.
2. Interior Finish: Corrosion-resistant coating.
3. Accessories: Include safety pressure relief valve, pressure gage, automatic moisture drain with manual bypass, and pressure-reducing valve.

E. Mounting Frame: Fabricate mounting and attachment to pressure vessel with reinforcement strong enough to resist packaged equipment movement during a seismic event when base is anchored to building structure.

2.02 LUBRICATED, RECIPROCATING AIR COMPRESSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Atlas Copco.
2. Gardner Denver, Inc.
3. Ingersoll-Rand; Air Solutions Group.
4. Kaeser Compressors, Inc.
5. Quincy Compressor; an EnPro Industries company.
6. Saylor-Beall Manufacturing Company.

B. Compressor(s): Lubricated, reciprocating-piston type with lubricated compression chamber and crankcase.

1. Submerged gear-type oil pump.
2. Oil filter.
3. Combined high discharge-air temperature and low lubrication-oil pressure switch.
4. Belt guard totally enclosing pulleys and belts.

C. Capacities and Characteristics:

1. Air Compressor: Two stage.

   a. Intercooler between stages of two-stage units.
2. Standard-Air Capacity of Each Air Compressor: Refer to Schedule on Drawings.
3. Discharge-Air Pressure: Refer to Schedule.
4. Mounting: Tank mounted.
5. Receiver: ASME construction steel tank.
   a. Arrangement: Vertical.
   b. Capacity: Refer to Schedule.
   c. Interior Finish: Galvanized coating.
   d. Pressure Rating: 200 psig.
   e. Drain: Automatic valve.

2.03 INLET-AIR FILTERS

A. Description: Combination inlet-air filter-silencer, suitable for remote installation, for each air compressor.

1. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.
2. Capacity: Match capacity of air compressor, with filter having collection efficiency of 99 percent retention of particles larger than 10 micrometers.

B. Description: Combination inlet-air filter-silencer, suitable for remote installation, for multiple air compressors.

1. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.

2. Capacity: Match total capacity of connected air compressors, with filter having collection efficiency of 99 percent retention of particles larger than 10 micrometers.

2.04 REFRIGERATED AIR DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Arrow Pneumatics, Inc.
2. Atlas Copco.
3. Donaldson Company, Inc.; Donaldson Ultrafilter Co.
4. Hankison International.
5. Ingersoll-Rand; Air Solutions Group.
6. Kaeser Compressors, Inc.
7. Van Air Systems, Inc.
8. Wilkerson Operations; Pneumatic Division.
9. Zeks Compressed Air Solutions.

B. Description: Noncycling, air-cooled, electric-motor-driven unit with steel enclosure and capability to deliver 35 deg F, 100-psig air at dew point. Include automatic ejection of condensate from airstream, step-down transformers, disconnect switches, inlet and outlet pressure gages, thermometers, high air temperature light, compressor operating light, automatic condensate drain, automatic controls, and filters.

C. Capacities and Characteristics: Refer to Schedule on Drawings.

2.05 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 15 Section "Motors."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 16 Sections.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Equipment Mounting: Install air compressors and air dryers on concrete bases using restrained spring isolators. Comply with requirements in Division 3 Section "Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Section 15070 "Vibration Controls for HVAC, Plumbing, and Fire Protection Piping and Equipment."

1. Minimum Deflection: 1/4 inch.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use 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.

B. Install compressed air equipment anchored to substrate.

C. Arrange equipment so controls and devices are accessible for servicing.

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Install the following devices on compressed air equipment:

1. Thermometer, Pressure Gage, and Safety Valve: Install on each compressed air receiver.
2. Pressure Regulators: Install downstream from air compressors and dryers.
3. Automatic Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain. Provide manual bypass on all automatic drain valves.
4. Make connection to air compressor discharge with flexible pipe connection.

3.02 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 1513 "Compressed Air Piping System." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Make connections between air compressors, receivers, and filters with unions or flanges as indicated on Drawings.

D. Provide dielectric union at all connections to copper piping when utilized.

3.03 IDENTIFICATION

A. Identify general-service air compressors and components. Comply with requirements for identification specified in Section 22 0553 "Identification."

3.04 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check for lubricating oil in lubricated-type equipment.
3. Check belt drives for proper tension.
4. Verify that air-compressor inlet filters and piping are clear.
5. Check for equipment vibration-control supports and flexible pipe connectors and verify that equipment is properly attached to substrate.
6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure but not higher than rating of system components.
7. Check for proper seismic restraints, if required.

8. Drain receiver tanks.
9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
10. Test and adjust controls and safeties.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air compressors and air dryers.

END OF SECTION

SECTION 22 33 13 WATER HEATERS - ELECTRIC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All work specified in this section is subject to the provisions of Section 23 0500 “Mechanical General.”

B. Refer to the following sections for related work in connection with electric water heaters:

1. 23 05 11 Mechanical Submittals
2. 23 05 53 Identification

1.02 DESCRIPTION OF WORK

A. The number and size of the electric water heaters are indicated on the Drawings and schedules and shall also include the following:

1. Tank Accessories
2. Concrete Pads

B. The types of electric water heaters required for the project include:

1. Electric Storage Type Water Heaters

1.03 QUALITY ASSURANCE

A. Manufacturing firms shall be regularly engaged in the manufacture of electric water heaters of type and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. ASME Code Symbol Stamps – Comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code Symbol.

C. Provide water heaters which comply with Energy Code and ASHRAE 90A for energy efficiency.

D. U.L. and NEMA Compliances – Provide electrical components required as part of electric water haters, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

E. NEC Compliance – Comply with the National Electric Code as applicable to installation and electrical connections of ancillary electrical components of electric water heaters.

1.04 SUBMITTALS

A. Product Data – Submit manufacturer’s water heater specifications, installation and start-up instructions.

B. Shop Drawings – Submit assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of all components.

C. Wiring Diagrams – Submit ladder type wiring/diagrams for all components, clearly indicating all required field electrical connections.

D. Maintenance Data – Submit maintenance data and parts lists for each item of accessory equipment. Include “trouble-shooting” maintenance guides. Include this data in maintenance manual.

PART 2 - PRODUCTS

2.01 GENERAL

A. Electric water heaters shall be of same manufacturer, unless specifically approved by Engineer. Refer to schedule for heater sizes, capacities, electrical characteristics and element operation.

2.02 ELECTRICAL STORAGE TYPE WATER HEATERS

A. Tank Materials – Tank shall be welded steel construction (conforming to ASME Code and provided with ASME stamp, 150 psi working pressure).

B. Lining – All interior tank surfaces shall be glass lined.

C. Elements – Electric heating elements shall be heavy duty medium watt density with incoloy sheath.

D. Enclosure – Heater shall be insulated in accordance with energy code and provided with steel enclosure with baked enamel finish.

E. Controls – Provide adjustable thermostat, high temperature cut off and low water cut off.

F. Accessories – Provide the following water heater accessories:

1. Magnesium anode
2. ASME combination temperature and pressure relief valve
3. Brass drain valve
4. Thermometer
5. Vacuum relief valve
6. Time clock with seven day, fourteen operations/week.

G. Warranty – Furnish five (5) year limited warranty for tank leakage.

H. Manufacturer – Provide water heaters meeting specification requirements of one of the following manufacturers:

1. A.O. Smith
2. Lochinvar
3. P.V.I.
4. Rheem
5. Ruud
6. State Industries

PART 3 - EXECUTION

3.01 INSTALLATION OF WATER HEATERS

A. Install water heaters as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes. Verify location and clearance requirements.

B. Bolt tanks to concrete housekeeping pads, level and plumb. Provide concrete pad.

C. Connections – Make connections between water heaters and domestic water piping shutoff valves with unions or flanges as indicated. Provide dielectric insulation at all tank connections.

D. Pipe heater drain and relief valve drain, full size to floor drain.

E. Coordinate voltage of water heaters with Electrical Contractor to insure proper installation.

F. Coordinate location of time clock with Electrical Contractor.

G. Identification – Provide sign securely attached to water heater identifying equipment number, service and capacity. Provide valve tags on all valves and provide identification on all piping connections to water heaters.

H. Testing – Upon completion of installation, pressure test water heaters hydrostatically to assure structural integrity and freedom from leaks in accordance with manufacturer's instructions, and comply with applicable health codes.

I. Disinfection and Flushing – Disinfect in accordance with potable water piping requirements and flush water heaters upon completion of installation in accordance with manufacturer's instructions, and comply with applicable health codes.

J. Start Up – Start up, test and adjust electric water heater in accordance with manufacturer's start-up instructions. Check thermostats and all controls to insure proper operation.

END OF SECTION

SECTION 22 42 00 PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of plumbing fixtures and trim work is indicated by the Drawings and Schedules, and by requirements of this Specification Section.

B. Refer to Division 26 sections for electrical connections to water coolers, emergency safety fixtures, and other plumbing fixtures. These electrical connections are not work of this Section.

1.03 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Residential Sinks: ASME A112.19.3.
2. Vitreous-China Fixtures: ASME A112.19.2M.
3. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets: ASME A112.18.1.
2. Supply Fittings: ASME A112.18.1.
3. Brass Waste Fittings: ASME A112.18.2.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.

B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

C. Fixtures shall be protected after installation to prevent scratches, dents, surface mar or any other damage during the course of construction. Fixtures that are scratched, chipped, or otherwise marred shall be replaced at the direction of the Architect and at no cost to the Owner.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete installation.

B. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

C. Fixture color shall be white unless noted otherwise.

2.02 MATERIALS

A. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, decoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

2.03 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shutdown of water supply piping systems.

B. Include removable P-traps where drains are indicated for direct connection to drainage system.

C. Provide cast-iron or steel supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron.

D. Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated cast-brass escutcheons with set screw.

F. Provide aerators on all faucet sets of types approved by the local Health Department having jurisdiction.

G. Comply with additional fixture requirements contained in "Plumbing Fixture Schedule" located on the Contract Drawings.

2.04 MANUFACTURERS

A. Subject to compliance with requirements of the Specifications, provide plumbing fixtures and trim of one of the following manufacturers:

1. Plumbing Fixtures – Water Closets, Urinals, Lavatories, Sinks, Bathtubs
   a. American Standard
   b. Kohler Company
   c. Mansfield Plumbing Products
   d. Sloan
   e. Toto
   f. Zurn Industries
2. Plumbing Faucets:
   a. American Standard
   b. Chicago Faucet Company
   c. Delta
   d. Elkay
   e. Encore
   f. Just
   g. Kohler Company
   h. Moen Incorporated
   i. Symmons
   j. Speakman Company
   k. Toto
   l. T & S Brass and Bronze Works, Inc.
   m. Zurn Industries, Hydromechanics Division
3. Plumbing Trim
   a. American Standard
   b. Chicago Faucet Company
   c. Delta
   d. EBC - (Engineered Brass Co.)

e. Eastman Brasscraft
f. Elkay
g. Encore
h. Just
i. Kohler Company
j. McGuire Manufacturing Co.
k. Moen Incorporated
l. Sanitary Dash Manufacturing Co.
m. Symmons
n. Speakman Company
o. Toto
p. T & S Brass and Bronze Works, Inc.
q. Watts Drainage Products
r. Zurn Industries, Hydromechanics Division

4. Flush Valves
   a. American Standard
   b. Coyne & Delany Company
   c. Kohler Company
   d. Sloan Valve Company
   e. Toto
   f. Zurn Industries, Hydromechanics Division
5. Fixture Seats
   a. American Standard
   b. Bemis Mfg. Co.
   c. Beneke Corp., Div. of Beatrice Foods
   d. Centoco
   e. Church Seats
   f. Comfort Seats
   g. Kohler Company
   h. Olsonite Corp., Olsonite Seats
   i. Toto
   j. Zurn Industries, Hydromechanics Division
6. Drinking Fountains / Water Coolers
   a. Acorn – Aqua
   b. Elkay Mfg. Co.
   c. Filtrine Manufacturing Co.
   d. Halsey Taylor Div.
   e. Haws Corporation
   f. Oasis
7. Service Sinks/Mop Sinks
   a. Acorn Terrazzo
   b. American Standard
   c. Fiat Products, Unit of Mark Control Corp.
   d. Florestone
   e. Kohler Company
   f. Stern-Williams Co., Inc.
   g. Toto
8. Stainless Steel Sinks
   a. Advance Tabco
   b. American Standard
   c. Elkay Mfg. Co.
   d. Just Mfg. Co.
   e. Kohler Co

9. Shower Valves and Trim
   a. American Standard
   b. Delta
   c. Kohler Company
   d. Leonard Valve Co.
   e. Moen, Div. of Standadyne/Western
   f. Powers
   g. Speakman Co.
   h. Symmons
   i. Toto
   j. Zurn Industries
10. Fixture Carriers
   a. Josam Mfg. Co.
   b. Jay R. Smith
   c. Mifab
   d. Wade
   e. Watts Drainage Products
   f. Zurn Industries, Inc., Hydromechanics Div.
11. Emergency Fixtures
   a. Acorn Safety
   b. Bradley
   c. Guardian Equipment
   d. Haws
   e. Speakman
   f. Western
12. Protective Coverings
   a. Brocar
   b. Handi – Lav Guard
   c. Plumberex Specialty Products
   d. Truebro

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.
   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 floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. 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.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Section 23 0523 “Valves”.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. 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.

M. Install toilet seats on water closets.

N. 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.

O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. 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.

Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.

R. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install disposer P-trap such that outlet of trap will prevent standing water to be left in disposer.

T. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck and on countertop at sink. Connect inlet hose to dishwasher and outlet hose to disposer.

U. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.

V. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Section 23 0500 “Mechanical General”.

W. Set bathtubs, shower receptors and service basins in leveling bed of cement grout.

X. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.03 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.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.04 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.

3.05 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.06 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.07 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 Owner.

PLUMBING FIXTURE SCHEDULE

	Fixture Description	Acceptable Manufacturers		
P1	WATER CLOSET-BOH: High efficiency, wall hung, 1.28 gallon exposed flush valve, vitreous china, siphon jet elongated bowl, 1-1/2 inch top spud, bolt caps, white.	American Std. 3353.128	Kohler K-4325	Toto CT708E
	SEAT: Heavy duty solid plastic, elongated open front, stainless steel check hinge, white.	American Std 5901.110	Kohler 4670-SC Beneke 523-SS	Toto SC534 Bemis 1955 - C
	FLUSH VALVE: 1.28 gallon flush, externally adjustable flush valve, 1-1/2 inch top spud coupling, wall and spud flanges, vandal proof trim, chrome plated.	Delany 402-1.5	Sloan 111-YB	Zurn Z6000-WS-1
	CARRIER: Adjustable horizontal and vertical.	J.R. Smith 210 series	Wade W-311 series	Zurn Z-1203 series
P1H	WATER CLOSET-PUBLIC ACCESSIBLE: Same as P1, except for mounting height. Coordinate mounting height with Architectural drawings and elevations. Orient handle to wide side of room or stall.			
P2	LAVATORY-PUBLIC:			
	LAVATORY: 20 inches by 17 inches self rimming countertop, vitreous china, 4 inch centers, front overflow, white.	American Std. 0476.028	Kohler K-2195	Toto LT501.4

FAUCET: Single lever handle, 4 inch centers, 0.5 GPM flow restrictor, pop-up drain, replaceable ceramic disc cartridge, aerator, 1-1/4 inch tailpiece, chrome finish.	American Std. 2000.100	Kohler K-15592-5	Zurn Z7440
SUPPLY: 1/2 inches I.P.S. by 3/8 inches O.D. angle supply, loose key stop, wall flange, chrome plated.	Brasscraft SR1712A	Kohler K-7676	McGuire 2165CCLK
DRAIN: 1-1/4 inches, 17 gallon open grid strainer and tailpiece, chrome plated.	Kohler K-7715	McGuire 155-A	Sanitary Dash R7304
TRAP: 1-1/4 inches by 1-1/2 inches, 17 gallon, adjustable P-trap with cleanout and wall flange, chrome finish.	Kohler K-8999	McGuire 8902	Sanitary Dash R870
LAVATORY WASTE TRAP PRIMER: 1-1/4 inch, 17 gallon, adjustable with cleanout and wall flange, trap primer tubing with wall flange, chrome plated. Provide in lieu of standard trap at locations indicated on drawings.	J.R.Smith 2698	Zurn Z1021	Kohler K-9000-CP

P2H LAVATORY-PUBLIC-ADA:

LAVATORY:	American Std.	Kohler	Toto
20 inches by 17 inches self rimming countertop, vitreous china, 4 inch centers, front overflow, white. ADA compliant	0476.028	K-2195	LT501.4
(8 inch centers)	0475.020		

FAUCET:	American Std.	Kohler	Zurn
Single lever handle, 4 inch centers, 0.5 GPM flow restrictor, replaceable ceramic disc cartridge, aerator, 1-1/4 inch tailpiece, chrome finish.	2000.100	K-15592-5	Z7440

SUPPLY:	Brasscraft	Kohler	McGuire
½ inches I.P.S. by 3/8 inches O.D. angle supply, loose key stop, wall flange, chrome plated.	SR1712A	K-7676	2165-LK

DRAIN:	Kohler	McGuire	Sanitary Dash
1-1/4 inch, 17 gallon offset drain with open grid strainer, chrome plated.	K-13885	155-WC	R7308

TRAP:	Kohler	McGuire	Sanitary Dash
1-1/4 inches by 1-1/2 inches, 17 gallon ground joint swivel P-trap with cleanout, chrome plated.	K-8995	8090	R807

INSULATION KIT:	Brocar	Handi Lav-Guard	Truebro
Self-fastening, flexible, vinyl insulation covers for drain, trap and supply piping with accessible cleanout and angle valve insulation covers, white.	Model C500R	Model 102&105	103E-Z

P2AH	LAVATORY-WALL HUNG-ACCESSIBLE: 20inches by 18 inches, wall hung 4" centers, concealed arms, front overflow and backsplash, white.	American Std. 0355.012	Kohler K-2005	Zurn Z5310
	FAUCET: Single lever handle, 4 inch centers, 0.5 GPM flow restrictor, replaceable ceramic disc cartridge, aerator, 1-1/4 inch tailpiece, chrome finish.	American Std. 2000.100	Kohler K-15592-5	Zurn Z7440
	SUPPLY: 1/2 inches I.P.S. by 3/8 inches O.D. angle supply, loose key stop, wall flange, chrome plated.	Brasscraft SR1712A	Kohler K-7676	McGuire 2165-LK
	DRAIN: 1-1/4 inch, 17 gallon offset drain with open strainer, chrome plated.	Kohler K-13885	McGuire 155-WC	Sanitary Dash R7308
	TRAP: 1-1/4 inches by 1-1/2 inches, 17 gauge ground joint swivel P-trap with cleanout, chrome plated.	Kohler K-8995	McGuire 8090	Sanitary Dash R807
	INSULATION KIT: Self-fastening, flexible, vinyl insulation covers for drain, trap and supply piping with accessible cleanout and angle valve insulation covers, white.	Brocar Model C500R	Handi Lav-Guard Model 102&105	Truebro 103E-Z

	CARRIER: Adjustable, floor support, concealed arms/wall hanger.	J.R.Smith 700 Series	Wade W-521 Series	Zurn Z1231 Series
P3H	URINAL-ACCESSIBLE: Wall hung, siphon jet, 1.0 gallon flush, vitreous china, 3/4 inch top spud, white.	American Std. 6561.017	Kohler K-4989-T	Zurn ZRNJ-5730
	FLUSH VALVE: Externally adjustable, 1.0 gallon flush, 3/4 inch top spud coupling, wall and spud flanges, vandal proof trim, chrome plated.	Sloan 186-1	Delany 451	Zurn Z-6003-WS
	CARRIER: Adjustable fixture hangar support and lower plate with bearing studs.	J.R.Smith 635	Wade W-452	Zurn Z-1222
P4	HAND SINK: 20 inches by 18 inches wall mounted 18 gauge Type 304 stainless steel, 5 inch deep bowl, seamless welded construction with 3 inch high back system	Elkay ELVW02219	Just A-33338	BK Resources BKHS-W-1820
	FAUCET 3-1/2 inch stainless steel crumb cup strainer with stopper, 1-1/2 inch stainless steel 4 inch long tailpiece	Elkay LK-358	Just J-35-STP	Zurn
	SUPPLY: 1/2 inches I.P.S. by 3/8 inches O.D. angle supply, wheel handle, wall flange, chrome plated	Brasscraft TCS400A-C	Kohler K-7676	McGuire 2165-LK
	TRAP: 1-1/2 inch 17 gauge adjustable with cleanout and wall flange, chrome finish	McGuire 8912	Kohler K-9000	Sanitary Dash

P5	SHOWER: SHOWER ENCLOSURE: By Architect			
	SHOWER VALVE: Pressure balanced valve with integral stops, adjustable temperature limit stops, lever handle, chrome finish	Kohler 15701-KS Base Valve with T 15111-4 Trim American Std. R110SS Va T372.248	Moen 8370	Speakman S-1420-SSM
	SHOWER HEAD: Adjustable spray, vandal proof, 2.5 GPM max. flow at 80 PSI, with arm and flange, chrome finish	Kohler K-8520 K-7397	Moen 12880	Speakman S2252-AFVCVR
	SHOWER DRAIN: 2inch FD "G" with 4inch square nickel bronze strainer.	Wade W-1102-GA	Kohler KOH7288	Westbrass D206B
P5H	SHOWER-ADA: SHOWER ENCLOSURE: By Architect			
	SHOWER VALVE: Pressure balanced with integral stops, adjustable temperature limit stops, lever handle chrome finish.	Kohler 15701-KS Base Valve with T 16111-4 Trim	Moen 8370	Speakman S-1420 SSM American Std. R110SS T372.248 1660.731
	SHOWER HEAD: Adjustable spray, vandal proof, 2.5 GPM max. flow at 80 PSI, with arm and flange, chrome finish	Kohler K-7397 K-8507 American Std. 1660.731	Moen 12880	Speakman S2252-AFVCVR

	HAND SHOWER ASSEMBLY: Aerated hand-held shower with 69 inch chrome plated flexible hose, swivel connector, 24 inch long adjustable slide bar, shower diverter, chrome finish.	Kohler K-8520 American Std. 1662.602	Moen 8345	Speakman VS-100 VS-145 VS-120 VS-123 VS-111
	TRANSFER VALVE: Chrome plated blade handle transfer valve.	American Std. R420 T010.430	Speakman S-1182	Symmons 4-458
	SHOWER DRAIN: 2 inch FD "G" with 4 inch square nickel bronze strainer.	Wade W-1102-G4	Zurn FD-B1NH4-C1-S5	Mountain Plumbing MT508A/GPB
P7B	SINK - BREAKROOM: 15 inches by 17-1/2 inches single compartment, 12 inches by 12 inches by 7-1/4 inches bowl, 20 gauge. Type 304, 18-8 stainless steel, self-rimming, underside fully undercoated, polished satin finish.	Elkay PSR-1517	Just SL-1815-B-GR	Kraus
	FAUCET: Deck mount washerless kitchen faucet with lever handles and fixed gooseneck spout, flex connectors and chrome finish.	Elkay	Kohler K-15850-4M	Zurn
	DRAIN: Brass adjustable crumb strainer, 1-1/2 inch tail piece chrome finish.	American Standard 4331-013	Kohler K-8801	Sanitary Dash
	SUPPLY: ½ inches I.P.S. by 3/8 inches O.D. angle stop, wheel handle, wall flange, chrome plated	Brasscraft OR1712DL	Kohler K-7663	McGuire 2166
	TRAP: 1-1/2 inch 17 gauge adjustable with cleanout and wall flange, chrome finish	McGuire 8912	Kohler K-9000	Sanitary Dash

P8H	ELECTRICAL WATER COOLER BI-LEVEL: ADA accessible, bi-level units, multiple push bar operated, heavy gauge, Type 304 stainless steel, wall mounted, fountain, unit to provide 8 GPH of 50 degrees F. water with 90 degrees F. ambient and 80 degrees F. supply water temperature, polished stainless steel finish.	Halsey Taylor HTV8BL-Q	Haws HWUAC8L Elkay EZSTL8C	Acorn/Aqua A112108F Oasis PF8ACSL
	SUPPLY: 3/8 inch copper tubing, wheel handle stop.			
	TRAP: 1-1/4 inches by 1-1/2 inches S.P.S. outlet, 17 gallon ground joint swivel trap with cleanout, chrome plated.	Kohler K-8995	McGuire 8090	Sanitary Dash R807
P8	EMERGENCY EYE/FACE WASH:	Guardian	Haws	Speakman
	Stay-open ball valve with stainless steel pull rod; 3/4 inch galvanized pipe with floor flange; stainless steel bowl with dual spray heads, stay-open ball valve with foot treadle and push flag operation.	G-1760 Acorn Safety S-0340	7361	
	MIXING VALVE: Thermostatic mixing valve rated at a minimum of 4 gpm at 10 psi pressure drop with vandal resistant temperature adjustment.	Bradley S19-2100	Guardian G3600	Powers ES150
	EMERGENCY ALARM: Watertight flow switch, junction box, alarm and wall mounted light 120V.	Guardian AP-250-2 Acorn Safety AL-2	Haws 9000	Western 9800

P9	3-COMPARTMENT SINK: 15 inches by 24 inches by 14 inches deep 8 inch high backsplash, 14, Type 304, stainless steel, fully undercoated, polished, satin finish, 1 5/8 inch O.D. tubular 16, stainless steel legs. Unit drilled for faucet and (3) 3-1/2 inch drain outlets.	Elkay SS8345	Advance Tabco	Eagle
	FAUCET: Service sink faucet with 10 inch swing spout, 8 inch centers, with stops, and lever handles	T & S B-B112J	Krowne	Kokler
	DRAIN: 3-1/2 inch Type 304 stainless steel perforated grid strainer, 1-1/2 inch diameter 4 inch tail piece and stainless steel lever arm	Elkay LK-24RT	American Standard	Kohler
	TRAP: 1-1/2 inch, chrome plated brass continuous waste for three compartment sinks, 1-1/2 inch O.D. 4 inch tailpiece.	Elkay 60	Kohler	Sanitary Dash

END OF SECTION

SECTION 22 42 23 COMMERCIAL SHOWERS, RECEPTORS, AND BASINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 RELATED DOCUMENTS

A. Section 09 05 15 – "Color Design."

1.03 SUMMARY

A. Section Includes:
1. Individual shower basin.
2. Grout.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for shower basins.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

PART 2 - PRODUCTS

2.01 SHOWER BASINS

A. Shower: Precast-terrazzo shower basin.

1. Manufacturers: Subject to compliance with requirements, provide products by the following
2. Basis-of-Design Product: Subject to compliance with requirements, provide Acorn Engineering Company, Terrazzo-Ware or comparable product by one of the following:
   a. Florestone Products Co., Inc.
   b. Stern-Williams Co., Inc.

3. General: Precast-terrazzo base for built-up-type shower fixture.
4. Standard: IAPMO PS 99 for precast-terrazzo material.
5. Type: Standard residential and Handicapped/wheelchair.
6. Nominal Size and Shape: 48 by 34 to 36 inches rectangular.
7. Color: As selected by architect from manufacturers full range of colors.
8. Outlet: Drain with outlet per mechanical engineers specifications.

9. Bathing Surface: Slip resistant according to ASTM F 462.

2.02 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where showers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Assemble shower basin components according to manufacturers' written instructions.

B. Set shower basins in leveling bed of cement grout.

C. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07920 "Joint Sealants."

3.03 CONNECTIONS

A. Connect fixtures with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with traps and soil and waste piping requirements specified in Section 15150 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

A. Adjust drain at basin edge so no protruding lippage occurs..

3.05 CLEANING AND PROTECTION

A. After completing installation of showers and basins, inspect and repair damaged finishes.

B. Clean showers basins and fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers and basins for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00 MECHANICAL GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Division and the accompanying Drawings cover furnishing of all labor, equipment, appliances, and materials and performing all operations in connection with the installation of complete air conditioning, ventilating, heating, plumbing and fire protection systems as specified herein and as shown on the Drawings.

B. The general provisions of the Contract including the Conditions of the Contract (General, Supplementary and other conditions) and other divisions as appropriate, apply to work specified in this division.

C. All work done under this Contract shall comply with all state and local codes having jurisdiction and with the requirements of the Utility Companies whose services may be used. All modifications required by these codes shall be made by the Contractor without additional charges. Any conflict between these documents and the governing codes shall be immediately brought to the attention of the Engineer of Record. Where code requirements are less than those shown on the Plans or in the Specifications, the Plans and Specifications shall be followed.

D. The Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction, and deliver certificates of approval to the Architect. All fees and costs of any nature whatsoever incidental to these permits, inspections and approvals must be assumed and paid by the Contractor.

E. The Contractor shall comply with all applicable provisions of the William-Steiger Occupational Safety and Health Act (O.S.H.A.).

F. The products of particular manufacturers have been used as the basis of design in preparation of these documents. Any modifications to the mechanical systems and their components, the electrical systems, the building structure and architecture, or any other portion of the building that result from the use of any other than the basis of design equipment shall be coordinated with all other trades. Such coordination shall occur before delivery of products from the manufacturer (before shop drawing submittals) and shall be clearly indicated on the shop drawings. All related modifications shall be borne by the Contractor and performed without any additional cost to the Contract.

G. All products shall be new and bear the Underwriter's Laboratories, Inc. (UL) label unless specifically indicated otherwise.

1.02 CODES AND REGULATIONS:

A. All heating, ventilating and air conditioning materials and workmanship shall comply with the following codes and standards as applicable:

1. The International Building Code
2. The International Mechanical Code
3. The National Electrical Code
4. All local amendments

B. All plumbing materials and workmanship shall comply with the following codes and standards as applicable:

1. The International Building Code
2. The International Plumbing Code
3. The International Gas Code
4. The National Electrical Code
5. All local amendments

C. All fire protection materials and workmanship shall comply with the following codes and standards as applicable:

1. The International Building Code
2. The International Fire Code
3. The International Fire Standards
4. The National Fire Protection Association Codes and Standards (latest edition)
5. The National Electrical Code
6. All local amendments

1.03 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this Specification to the extent referenced and are referred to in the text by the basic designation only.

1. Air-Conditioning and Refrigeration Institute Standards (ARI)
2. American National Standards Institute, Inc. Standards (ANSI)
3. American Society for Testing and Materials Publications (ASTM)
4. American Gas Association Inc. Laboratories (AGA)
5. American Society of Mechanical Engineers Code (ASME)
6. Factory Mutual Underwriters (FM)
7. National Fire Protection Association Standards (latest edition)
8. Sheet Metal and Air Conditioning Contractors' National Association Inc. (SMACNA)
9. Underwriters Laboratories, Inc. (UL)

1.04 RELATED DOCUMENTS

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

1.05 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.
4. ABS: Acrylonitrile-butadiene-styrene plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.06 PERFORMANCE REQUIREMENTS

A. General Performance of all materials and/or products shall withstand installation and performance without failure due to defective manufacture, fabrication, installation, or other defects in construction. Materials shall remain watertight and airtight when subjected to those conditions.

B. Structural Performance of all materials and/or products shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

C. Seismic Performance of all materials and/or products shall withstand the effects of earthquake motions determined according to SEI/ASCE 7. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

D. All materials and/or products shall allow for thermal movements from ambient and surface temperature changes. Temperature Change (Range) shall be considered unless otherwise noted, 120°F, ambient to 180°F measured at the material surfaces.

1.07 SUBMITTALS

A. Submittal requirements are more fully defined under Section 15051 in these Specifications.

B. Specific emphasis is brought onto the subject of Coordination Drawings that are required under the Submittals section. They shall be drawn to scale and the following items are to be shown and coordinated with each other, using input from Installers of the items involved:

1. Mechanical piping
2. Ductwork system (including diffusers)
3. Plumbing Piping
4. Electrical conduits (over 4 inches)
5. Lighting fixtures
6. Architectural and Reflected ceiling elements
7. Structural components.

C. Seismic Qualification Certificates: For ALL accessories and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM C 1021 or ASTM C 1093 for testing indicated.

D. Testing Agency Qualifications: Member companies of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

E. Obtain each color, grade, finish, type, and variety of materials or products from one source with resources to provide consistent quality in appearance and physical properties.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code –Steel; D1.2/D1.2M, "Structural Welding Code – Aluminum; D1.3, "Structural Welding Code - Sheet Steel; or D1.4, "Structural Welding Code - Reinforcing Steel."

G. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

H. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

I. Fire-Resistance Ratings: Where indicated, provide products or materials identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
2. Combustion Characteristics: ASTM E 136.

J. 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.

K. ASME Compliance: Equipment indicated to be fabricated and labeled to comply with ASME Boiler and Pressure Vessel Code.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.10 PROJECT CONDITIONS

A. Do not install any materials or components that are wet, moisture damaged, or mold damaged.

B. Do not deliver or install any materials or components until spaces are enclosed and weather tight, wet work in spaces is complete and dry and any required temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

C. Proceed with installation only when existing and forecasted weather conditions permit materials or components to be performed according to manufacturer's written instructions and warranty requirements.

D. Contractor shall verify actual dimensions of any openings or construction contiguous with any materials or components by field measurements before fabrication.

1.11 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

1.12 WARRANTY

A. Contractor shall supply the manufacturer's standard form in which manufacturer agrees to repair or replace any materials or components that fail(s) in materials or workmanship within the one year specified warranty period from Substantial Completion.

1.13 SOFTWARE SERVICE AGREEMENT

A. Technical Support shall be defined as beginning with Substantial Completion; software support shall be supplied for two years.

B. Update any required software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.14 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers listed shall be subject to compliance with requirements. It should be noted that not all manufacturers of a particular product may be listed. Any manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified. Contractor requested manufacturers to be added to list shall follow the Substitution process defined under the Architect's Contract Specification Division 1.

2.02 MOTORS

A. Contractor shall comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

2.03 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 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.

2.04 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
3. ABS Piping: ASTM D 2235
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.05 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Eslon Thermoplastics.
2. NIBCO INC.
3. Thompson Plastics, Inc.

B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Thompson Plastics, Inc.
2. Eslon Thermoplastics.
3. NIBCO INC.

C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. NIBCO INC.
2. NIBCO, Inc.; Chemtrol Div.
3. Thompson Plastics, Inc.

D. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.

1. Cascade Waterworks Mfg. Co.
2. Dresser Industries, Inc.; DMD Div.
3. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
4. JCM Industries.
5. Smith-Blair, Inc.
6. Viking Johnson.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Cascade Waterworks Mfg. Co.
2. Fernco, Inc.
3. Mission Rubber Company.
4. Plastic Oddities, Inc.

2.06 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 minimum working pressure at 180 deg F.

1. Coordinate subparagraph and associated subparagraphs below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.
2. Capitol Manufacturing Co.
3. Central Plastics Company.
4. Eclipse, Inc.
5. Epco Sales, Inc.
6. Hart Industries, International, Inc.
7. Watts Industries, Inc.; Water Products Div.
8. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Coordinate subparagraph and associated subparagraphs below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.
2. Capitol Manufacturing Co.
3. Central Plastics Company.

4. Epco Sales, Inc.
5. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Separate companion flanges and steel bolts and nuts shall have 150 psig or 300 psig minimum working pressure where required to suit system pressures.

1. Coordinate first subparagraph and associated subparagraphs below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.
2. Advance Products & Systems, Inc.
3. Calpico, Inc.
4. Central Plastics Company.
5. Pipeline Seal and Insulator, Inc.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225°F.

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225°F.

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America

2.07 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

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: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.08 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch 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.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

2.09 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.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Rough brass.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.10 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink 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, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 GENERAL

A. The Mechanical, Plumbing and Fire suppression plans do not give exact elevations or locations of lines, nor do they show all the offsets, control lines, or installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and to thereby provide an integrated and coordinated installation operating at optimum performance.

B. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect review the change before proceeding with the work. The request for such changes shall be accomplished by Shop Drawings of the space in question. All related costs incurred shall be borne by the Contractor and performed without any additional cost to the contract.

C. The Contractor shall be responsible for the proper location and size of all slots, holes or openings in the building structure pertaining to his work, and for the correct location of sleeves, inserts and cores.

D. The Contractor shall coordinate the work of the several various trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. For example, sewer lines and condensate piping shall take precedence over water lines in determination of elevations. Where there is interference between sewer lines and condensate lines, the sewer lines shall have precedence and provisions shall be made in the condensate lines for looping them around the sewer lines. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.

E. All piping and ductwork in kitchens and finished areas shall be installed in chases, furred spaces, or above ceilings. Pipes and ducts shall be installed as high as possible. Valves in piping systems shall be offset down to within one (1) foot of access point. Runs of piping shall be grouped whenever it is feasible to do so.

F. Piping, equipment, or ductwork shall not be installed in electrical equipment rooms, elevator machine rooms or computer rooms except as serving only those rooms. In electrical equipment rooms, do not run piping or ductwork, or locate equipment with respect to switchboards, panel boards, power panels, motor control centers, or dry type transformers:

1. Within 42 inches in front (and rear if free standing) of equipment; or
2. Within 36 inches of sides of equipment.
3. Clearances apply vertically from floor to structure.

G. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system. Devices include but are not limited to are: motors, valves, filters, dampers, and shock absorbers. Equipment located above lay-in type ceilings is considered accessible.

H. Locate required terminal boxes, valves and dampers in areas accessible for maintenance. Note that no access panels are permitted in public spaces unless specifically noted on Contract Documents.

3.02 ELECTRICAL WORK

A. Locate required junction boxes, terminal points and access points in areas accessible for maintenance. Note that no access panels are permitted in public spaces unless specifically noted on Contract Documents.

B. All electrical equipment provided under this Division shall comply with the electrical system characteristics indicated on the Electrical Drawings and specified in Division 26.

C. Air handling unit motor speed controls, starters for chillers, boiler control package and packaged pump systems shall be furnished complete as a part of the motor apparatus which it operates. All other motor starters for HVAC and Plumbing equipment shall be furnished under Division 26. All components shall be in conformance with the requirements of the National Electrical Code and Division 26.

D. All power wiring and final power connections to the system shall be provided under Division 26.

E. Control wiring (120V and less) shall be provided under Division 23 and extended from the 120 volt power circuits indicated in the Electrical Drawings. All wiring for voltages higher than 30 volts shall be done by a licensed electrician.

F. All electrical characteristics shall be taken from the Electrical Drawings and Specifications and coordinated with the Electrical Contractor prior to equipment being ordered or shop drawings submitted.

3.03 MOTORS

A. Unless specifically noted otherwise in other sections of this Specification, all motors and motor controllers shall meet the requirements specified in this Section. All motors shall be built in accordance with the current applicable IEEE and NEMA standards, and shall have voltage, phase, frequency and service as scheduled in the Electrical Documents.

B. Each motor shall be of the premium efficiency type, rated for use with a variable frequency drive. They shall be suitable for the required brake horsepower of the driven unit, rated with 1.15 minimum service factor, and shall be NEMA Design B. The minimum ambient temperature rating that the motor shall be suitable for operation in shall not be less than 40°C for drip proof and totally enclosed fan cooled motors. The motor shall be capable of operating continuously at such temperature with minimum deterioration, and shall be capable of withstanding momentary overloads of 10% without injurious overheating.

C. Each item of motor driven equipment shall be furnished complete with the motors and drives as required to perform the specific function for which it is intended, scheduled and specified.

D. Motors shall be ball bearing type selected for quiet operation and shall be manufactured for general purpose duty unless otherwise indicated. Each bearing shall be accessible for lubrication and designed for the load imposed by the V-belt drive or the driven apparatus. Direct drive motors shall be designed for the specific application with all necessary thrust bearings, and shaft capacities.

E. Motors larger than one-half (1/2) horsepower shall have bearings with pressure grease lubrication fittings.

F. Motors connected to drive equipment by belt shall be furnished with screw adjustable slide rail or pivoting type bases except that fractional horsepower motors may have slotted bases. Motor leads shall be permanently identified and supplied with connectors.

G. Each motor to be installed outdoors shall be of the totally enclosed fan cooled type, or housed in a weatherproof housing that is an integral part of the driven equipment.

H. Unless otherwise indicated, motors smaller than one-half (1/2) horsepower shall be capacitor start or split phase type designed for 120 volt, single phase, 60 cycle alternating current. Shaded pole motors are not acceptable except 35 watts and smaller. Motors one-half (1/2) horsepower and larger shall be squirrel cage induction type, 3 phase, 60 cycle alternating current.

I. Multi-speed motors shall, except as noted, be consequent pole, variable torque, single winding. When the speed ratios or the load characteristic dictates, the multi-speed motors shall be separate winding types.

J. Variable speed motors operating over an adjustable range of speeds shall be motors specifically designed and rated for this duty.

K. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect of the change by clearly identifying it on the shop drawing or submittal and shall then coordinate the change with all associated trades effected and shall bear all additional charges in connection with the change.

3.04 PROTECTION OF EQUIPMENT

A. Store all equipment, including pipe and valves, off the ground and under cover. For storage outdoors, minimum four (4) mil thick plastic sheets shall be securely fitted over equipment to withstand splattering, ground water, precipitation and wind.

B. Protect air handling unit coils by use of protective sheet metal panels or plywood.

C. Plug ends of pipe when work is stopped and close ends of ducts with four (4) mil thick plastic sheets taped in place until work resumes. Duct tape without plastic sheets is not an acceptable substitute.

D. Damaged equipment shall be repaired or replaced at the option of the Engineer.

3.05 PAINTING

A. Any factory painted equipment that has been scratched, damaged or marred during Contractor handling, installation or commissioning shall be repainted to match the original factory supplied color and finish.

B. All uninsulated black ferrous metal items exposed to sight inside the building, (such as condenser water piping, standpipes, equipment hangers and supports, miscellaneous metals) shall be cleaned and painted with one (1) coat of zinc chromate primer. In addition, such items in finished spaces shall also be painted with two (2) coats of finish paint in a color to match adjacent surfaces or as otherwise selected by the Architect.

C. Black ferrous metal, cast iron and copper items exposed outside the building, (such as cooling tower support beams, uninsulated pipe and pipe supports, miscellaneous metals) shall be cleaned and painted with one (1) coat of rust inhibiting primer and two (2) coats of an asphaltic base aluminum paint. Insulated pipes outside the building shall be cleaned and painted with one (1) coat of rust inhibiting primer before installing insulation.

D. In lieu of painting hanger rods, cadmium plated or galvanized rods may be furnished.

E. No nameplates or equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

F. Any galvanizing broken or damaged during Contractor handling, installation or related construction activities shall be re-coated with cold galvanizing compound.

G. All ductwork, piping, insulation, conduit, miscellaneous metals or other appurtenances visible through grilles and diffusers shall be painted flat black.

3.06 PROTECTION OF EXISTING UTILITIES

A. The Contractor shall use extreme caution during excavation operations not to damage or otherwise interrupt the operations of existing utilities. The Contractor shall be responsible for the continuous operation of these lines and shall provide bypasses or install such shoring, bracing, or underpinning as may be required for proper protection.

B. Work shall be scheduled and coordinated so that existing systems of all types will not be interrupted when they are required for normal usage [of the existing building]. The Owner's Representative and the Architect shall be informed, and approval obtained from the Utility Authority involved at least seven (7) days prior to any utility interruption or connection.

3.07 CUTTING AND PATCHING

A. The Contractor shall assume all cost of, and be responsible for, arranging for all cutting and patching required to complete the installation of his portion of the Work. All cutting shall be carefully and neatly done so as not to damage or cut away more than is necessary of any existing portions of the structure. Cutting of or welding on any portion of the building structure shall be done only with the express consent of the structural engineer.

B. All affected surfaces shall be reinstated to the condition of the adjacent surfaces.

C. The Contractor shall make suitable provisions for adequately water-proofing any floor or roof penetrations necessary for the installation of the mechanical, plumbing and fire suppression systems. This shall include, but not be limited to, floor drains, floor sinks, open sight drains, hub drains, cleanouts, and sleeves for the various piping and ductwork systems.

3.08 SLEEVES, FLOOR AND CEILING PLATES

A. The Contractor shall install in concrete, carpentry or masonry construction, all necessary hangers, sleeves, expansion bolts, inserts and other fixtures and appurtenances necessary for the support of all pipe, duct, equipment and devices furnished under each section of the Specification.

B. Cutting of openings and installation of sleeves or frames through walls and surfaces shall be done in a neat workmanlike manner. Openings shall be cut only as large as required for the installation; sleeves, and/or frames shall be installed flush with finished surfaces and grouted in place unless otherwise indicated. Surfaces around openings shall be left smooth and finished to match surrounding surface.

C. Where pipes pass through floor slabs, sleeves shall be standard weight black steel pipe with top of sleeve three (3) inches above finished floor. Where pipes pass through walls, sleeves shall be standard weight black steel pipe or 20 galvanized sheet metal with ends flush with wall surfaces.

D. Each pipe or duct passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameters one (1) inch larger than the outside dimensions of insulated pipes or ducts.

E. All pipe sleeves through existing floors, roofs and masonry walls shall be built in place as the affected walls, floors and roof are constructed.

F. All penetrations through rated floors and walls shall have their sleeved opening packed with mineral wool and capped off with a fire rated sealant as manufactured by Hilti, 3M or Dow. Materials shall meet or exceed UL 1479 or ASTM E814 requirements.

G. Sleeves through exterior walls shall be steel or cast iron pipe, flush with the exterior surfaces, and with the space between the pipe and the sleeves caulked watertight.

H. Inserts shall be individual type (cast iron) or (galvanized steel), with accommodations for removable nuts and threaded rods up to 3/4 inch diameter, and permitting lateral adjustment. Reference Specification Section 15060 “Hangers and Supports” for additional details.

3.09 ESCUTCHEONS

A. Escutcheons shall be installed on all pipes where they pass through floors, ceilings, walls, or partitions in exposed construction areas.

B. The interior of closets, adjacent to finished areas, shall be considered as finished for the intent of these Specifications.

C. Escutcheons shall be split, hinged, chrome plated, stamped brass type, designed to fit the pipe, and to cover the terminating pipe sleeve. Escutcheons shall have a positive securing device to hold the escutcheon tight to the pipe and the wall or floor.

D. Sufficient spacing between parallel pipe runs shall be allowed to insure that the installation of the escutcheons can be done without modification to or overlapping of the escutcheons is necessary. The escutcheons shall not be altered or overlapped in any manner to allow for their installation.

3.10 CLEANING

A. Sterilize the domestic water supply and distribution system in accordance with the local codes having jurisdiction. Furnish three copies of a Certificate of Performance of Complete Sterilization to the Architect before final inspection of the work, all work shall be certified by a State approved testing laboratory.

B. Flush new water piping systems until water runs clear. Mild chemical cleaning may be required. If so, flush all cleaning chemicals out of the piping system before recharging with water.

C. Remove all stickers, rust, stains, labels, and temporary covers from all items of mechanical, plumbing and fire protection equipment and appurtenances before final acceptance.

D. The exterior surfaces of all mechanical equipment, piping, and ducts, shall be cleaned of all grease, oil, paint, dust and other construction debris.

E. The interior of all air handling units, fans, fan coils, blowers, ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of dirt, rubbish and dust before installing any air distribution devices.

F. Bearings that require lubrication shall be lubricated in accordance with the manufacturer's recommendations. Provide two copies of the certification of lubrication.

G. Equipment rooms shall be left broom clean.

H. Any fans operated during construction shall have temporary filters. Temporary filters shall be changed regularly to prevent contamination of the equipment and duct systems. New and unused permanent filters shall be installed one week or less prior to final inspection.

I. Clean and polish identification plates.

3.11 EQUIPMENT, MATERIALS AND BID BASIS

A. It is the intention of these Specifications to indicate a standard of quality for all material and equipment that will be incorporated into this project. Manufacturer's names are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only these manufacturers' products will be considered and the Contractor's bid shall be based on their products. Other unnamed manufacturers, although acceptable as manufacturers, must prove their product will perform satisfactorily and will meet space requirements, and they shall obtain pre-approval of their equipment, before submitting bids and/or shop drawings.

B. Where only one manufacturer is named, manufacturers of similar quality products will not be considered unless the Contract Specifications state otherwise. When stated otherwise, such unnamed manufacturer's products will, however, be considered as substitutions but shall not be used as a basis for bidding. In the event the Contractor wishes to submit substitutions to the Architect for review prior to bid, he shall furnish descriptive catalog material, test data, and samples, as well as any other pertinent data necessary to demonstrate that the proposed substitutions are acceptable to the specified product. No substitutions shall be made without the written consent of the Architect.

C. The use of a named manufacturer in any equipment schedule on the Drawings is for guide purposes only. The provisions of these paragraphs will govern in the selection of products to be used.

3.12 WARRANTY

A. All systems and components shall be provided with a one year warranty from the time of final acceptance unless otherwise noted in the Contract Documents. The warranty shall cover all materials and workmanship. During this warranty period, all defects in materials and workmanship shall be corrected by repair or replacement without incurring any additional cost to the Contract.

B. All reciprocating air conditioning compressors shall be warranted for an additional four (4) years. This additional warranty shall include parts only.

3.13 FOUNDATIONS

A. Concrete foundations are required for all equipment furnished under Division 23. Unless otherwise noted, foundations shall be six inches high.

B. All concrete work performed shall conform entirely to the requirements of the General Specifications which describe this class of work. They shall be constructed in conformance with the recommendations of the manufacturer of the respective equipment that will actually be supplied, and with the approval of the Architect. All corners of the foundations shall be neatly chamfered.

C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch below the equipment bases for alignment, leveling and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed and re-aligned, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.

3.14 RECORDS AND INSTRUCTIONS FOR OWNER

A. The Contractor shall accumulate during the job's progress the following data electronically to be stored on a CD, memory drive or other accessible media and turned over to the Architect /Engineer for checking and subsequent delivery to the Owner:

1. All warranties, guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Approved fixture brochures, wiring diagrams, and control diagrams.
3. Copies of approved shop drawings.
4. Operating instructions for heating, cooling and other mechanical systems. Operating instructions shall also include recommended periodic maintenance and seasonal changeover procedures, and suggested procedures in the operation of all systems in this particular building to promote energy conservation. These instructions must be written expressly for this project and shall refer to equipment, valves and devices by mark and number from the project schedules. Operating instructions and procedures shall be submitted in draft form, for approval, prior to final issue of complete brochures. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
5. Any and all other data and/or drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
7. Valve tag charts and diagrams as specified elsewhere herein.

B. A copy of the above data shall be submitted to the Architect/Engineer for approval at such time as the Contractor asks for his last inspection prior to the final inspection, but in no case, less than two weeks before final inspection.

C. The Contractor shall also give not less than three days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. The twenty-four hours shall be broken into a series of 6 four hour sessions. The written operating instructions referred to in the paragraph above shall be used as a basis for this on-the-job instruction.

D. A competent technician employed by the Temperature Control Subcontractor will be required to instruct the Owner’s personnel in the proper operating procedures and shall explain the significance of the temperature control literature filed in the maintenance manual over a period of two days while the system is in continuous operation.

E. Contractor shall submit the name and qualifications of the temperature controls instructor(s) with a list of five previous projects and client contacts for reference. The Owner reserves the right to change instructor(s) upon verification of references.

3.15 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of "Record Drawings", reflecting an accurate dimensional record of all new buried or concealed work. The "Record Drawings" shall be marked to show the precise location of concealed work and equipment, including concealed or embedded piping and valves and all changes and deviations in the Mechanical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite instructions from the Architect.

B. The Contract "Record Drawings" shall consist of a set of electronic files of the Contract Drawings for this Division with the Engineer's seal and Engineer's firm name removed or blacked out. Prior to commencing work the Contractor shall purchase from the Architect a set of architectural electronic backgrounds to be used for the "Record Drawings".

C. Record dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two dimensions to structural column lines or a permanent accessible structure or datum.

D. The Contractor shall mark all "Record Drawings" in the front lower right hand corner with a written indication that states the following:

"RECORD DRAWINGS” (3/8 inch high letters)
“To be used for recording Field
Deviations and Dimensional Data Only". (5/16 inch high letters)

3.16 INSTALLATION

A. All equipment shall be installed in strict conformance with the manufacturer's recommendations, as specified herein and as shown on the drawings. If any conflict arises between these instructions, notify the Engineer immediately for guidance.

3.17 VALVE CHART AND LABELS

A. Contractor shall prepare and install in a suitably glazed frame, typewritten valve charts giving the number, location and function of each line valve installed under this Contract. The Contractor shall also install on each valve stem a stamped one and one-half inch (1-1/2") diameter brass tag plainly numbered corresponding to the number indicated on the above chart. Tags shall be secured to valves by heavy figure eight hooks.

3.18 EQUIPMENT LABELS

A. Each item of equipment shall be permanently labeled with a nameplate of sufficient size to clearly indicate the identification designation (i.e., equipment number) appearing on the Contract Document. Nameplates may be 1/16" thick Bakelite laminate, engraved with letters through black, or aluminum with black enameled surface, with engraved letters. Handwritten marker identifications are not acceptable.

B. The installation of any product, finish or surface in the "public space" which has a readily observable exposed name, trademark, insignia, logo or any other identification mark, symbol or embossment (intended to identify manufacturer, model, or vendor) is not acceptable. This prohibition applies but is not limited to fire alarm devices, dimmers, light fixtures, plumbing fixtures, temperature sensors, thermostats, air conditioners, floor drains, and cleanouts.

3.19 ACCESS DOORS

A. Furnish and install access doors at each point required to provide access to concealed valves, cleanouts, fire dampers and other devices requiring operation, adjustment, or maintenance. Access doors shall be prime coat finished 16 gauge steel, with mounting straps, concealed hinges and screwdriver locks, designed for the doors to open 180°.

B. Access doors installed in fire walls or partitions shall be U.L. Labeled to maintain the fire rating of the wall or partition.

C. Access panels in ceilings are allowed only in back-of-house areas. Access panels in public areas are not acceptable unless specifically shown or noted on the Drawings or approved in writing by the Engineer prior to installation.

3.20 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Materials and adhesives used throughout the mechanical and incidental electrical systems, for insulation, jackets or coverings of any kind, or for piping or conduit system components, shall have a flame spread rating not over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. If such materials are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not higher than 50. Materials need not meet the above listed requirements where they are located entirely outside of a building and do not penetrate a wall, floor or roof, and do not in any way create an exposure hazard.

B. "Flame-Spread Rating" and "Smoke Developed Rating" shall be as determined by the "Method of Test of Surface Burning Characteristics of Building Materials," NFPA No. 255, ASTM E84, Underwriter's Laboratories, Inc., Standard". Such materials are listed in the Underwriters' Laboratories, Inc., "Building Materials List" under the heading "Hazard Classification (Fire)".

3.21 EQUIPMENT FURNISHED BY OWNER

A. The Contractor shall unload, uncrate, assemble, and make final connection to any and all equipment shown on the Drawings or called out in the Specifications to be furnished by the Owner for installation by the Contractor.

B. The Contractor shall take full charge of such equipment from the time the items are delivered to the job. The Contractor shall be responsible for such items until they are set in place, connected, tested, adjusted, and placed into operation as if the Contractor were the original purchaser.

3.22 HAZARDOUS MATERIALS

A. No products shall be used that contain any known hazardous or carcinogenic materials. Products with asbestos or radioactive content shall not be used.

B. Handling of any hazardous material is not covered in this Specification Division. Any requirements for such are beyond the scope of this Contract and shall be done only by those persons contracted to do so.

3.23 BELT DRIVES

A. Provide guards for all belt drives not totally enclosed within equipment housings. Belt guards for fans shall be expanded metal with heavy gauge sheet metal sides. Provide an opening in the guards at the center of the driving and driven sheaves to facilitate the use of a tachometer or revolution counter to determine rotational speed.

3.24 FREEZE PROTECTION

A. During construction, the Contractor shall assure that no portion of his work is subjected to freeze damage. The Contractor shall take all steps necessary such as temporary heat, draining of systems, heat tape, antifreeze solutions or other means to prevent damage. No antifreeze solutions shall be used in potable water systems. Any resultant damages from freezing shall be the responsibility of the Contractor to repair at no additional cost to the contract.

B. Prior to start up of any air handling unit supplied with water coils, when the ambient temperature is below 40 degrees F, the Contractor shall make certain the incoming volume of outside air is not sufficient to drive the mixed air temperature below 35 degrees F.

3.25 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 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.

3.26 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 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.

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 by applying appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

G. 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.

H. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

J. 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.

K. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

L. 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.

M. PVC Nonpressure Piping: Join according to ASTM D 2855.

N. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

O. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

P. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

Q. Plain-End Pipe and Fittings: Use butt fusion.

R. Plain-End Pipe and Socket Fittings: Use socket fusion.

S. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.27 PIPING CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

C. Edit dielectric connection types in two subparagraphs below for each fluid.

D. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

E. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.28 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC 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.

3.29 PAINTING

A. Division 9 Sections specify paint products for various surfaces (e.g., ferrous and nonferrous metals and insulation jackets), HVAC items to be field painted, application methods, and coating systems (number of prime and finish coatings and coating thicknesses). Coordinate these requirements with Architect to ensure that appropriate painting requirements are indicated in the Division 9 Sections.

B. Painting of HVAC systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.30 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 HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.31 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate the indicated members if opposite side will be exposed to view or is to receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.32 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 23 05 11 MECHANICAL SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, and Section 23 0500 apply to all work herein.

1.02 QUALITY ASSURANCE

A. Nine (9) copies of shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract.

B. Before submitting Shop Drawings to the Architect for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of the Shop Drawings is not intended to take the place, in any way, of the official review of the Architect, and Shop Drawings which have not been reviewed by the Architect shall not be used in fabricating or installing any work.

C. The review of Shop Drawings or catalog data by the Architect shall not relieve the Contractor from responsibility for deviations from the Plans and Specifications unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the Architect thereon; nor shall it relieve him from responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect, he shall state in his letter whether or not such deviations involve any extra cost. If no additional costs to the Contract are specifically noted, it will be assumed that no extra cost is involved for making the change.

D. Verification and assignment of dimensions, quantities, and construction means, methods, sequences or procedures, the correctness of which is set forth in the Contract Documents or submittal, shall be the sole responsibility of the Contractor.

E. Reproduction of design documents in any portion for use in a submittal is not acceptable.

F. The Engineer or Architect reserves the right to require a sample of any equipment to be submitted for approval and to retain its possession.

G. The shop drawing and product data review stamp notation requirements are defined as follows:

1. "NO EXCEPTIONS TAKEN": The reviewer did not observe any items which were not in compliance with the Contract Documents. All dimensions, details and coordination with other trades is the responsibility of the Contractor. The submittal is not required to be resubmitted and is ready for distribution to the field and shall be included in the "Record Drawings".
2. "MAKE CORRECTIONS NOTED": The reviewer indicated items observed which were not in compliance with the Contract Documents. The Contractor shall not resubmit, but shall make corrections, and provide corrected document with the "Record Drawings". All dimensions, details and coordination with the other trades is the responsibility of the Contractor.

3. "AMEND AND RESUBMIT": The reviewer indicated items observed which were not in compliance with the Contract Documents. The Contractor shall resubmit showing corrections of all noted items. Delays for resubmittal does not relieve the Contractor from meeting project schedules.
4. "REJECTED - SEE REMARKS": The submission does not comply with the contract requirements. The Contractor shall resubmit the correct drawing or piece of equipment for review. Delays for resubmittal does not relieve the Contractor from meeting project schedules.
5. "SUBMIT SPECIFIED ITEM": The submission does not comply with the contract requirements. The Contractor shall resubmit the correct drawing or piece of equipment for review. Delays for resubmittal does not relieve the Contractor from meeting project schedules.

H. If resubmittals are necessary, they shall be made as specified herein for submittals. Resubmittals shall highlight all revisions made and cover shall include the phrase "RESUBMITTAL NO. __."

PART 2 - PRODUCTS

2.01 GENERAL

A. All product samples shall be new and bear all labels which are identified by the applicable specification section and Contract Documents.

B. All submittals made on this project shall be electronic in nature and forwarded to the Engineer's Project Manager as the single point of contact.

C. All submittals will be returned to the Architect in electronic form following the review, annotations and affixing of the review stamp. Subsequent distribution of copies will be handled by him.

PART 3 - EXECUTION

3.01 SUBMITTAL DATA

A. General

1. The submittal data to be furnished for this project shall comply with the Specifications and Contract Documents in their entirety. Any submittals herein scheduled are as a minimum only and shall not be construed to limit the submittal data required within the individual Sections of these Specifications.
2. HVAC, Plumbing and Fire Protection submittal data shall be bound into separate HVAC, Plumbing and Fire Protection electronic volumes, with each volume containing one (1) copy of <u>all</u> specified equipment shop drawings. The submission shall be clearly noted with an identification tab for each Specification Section that requires submittals. Each item in each tabbed section shall be identified with the paragraph number relating to the item submitted by the use of a cover sheet or by highlighting the paragraph on the first page concerning the item. If necessary, information shall be submitted with the original submittal data and will address and resolve all comments thereon. All submittals shall include identification tabs and sufficient space for all submittal data. FAILURE to provide complete bound and identified submittals will result in the automatic rejection of the submittal data with no exception.

3. Shop Drawings will be returned unchecked unless the following information is included: Reference to all pertinent data in the Specifications or on the Drawings, such as sound power levels of motor driven equipment where called for in the Specifications, electrical characteristics and horse power, capacities, construction material of equipment, UL labels and ASME stamps where required, accessories specified, manufacturer, make and model number, weights where specified, starters where required by Division 23, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the Drawings. All submitted equipment must be identified on Shop Drawings with same "Mark Numbers" as identified on Drawings or in Specifications. All pertinent data such as accessories shall also be marked. Any deviation from any part of the Contract Documents shall be clearly and completely highlighted.
4. The packaged submittals are to be submitted for review within thirty (30) days after the Contract is awarded. No submittal will be checked until all required submittals have been submitted in one complete package. Only Automatic Temperature Controls, ductwork and piping fabrication drawings may be submitted after the complete submittal is reviewed and accepted by the Architect/ Engineer.
5. The Contractor shall submit with the package, an identified submittal data a letter signed by the Contractor's Project Manager or higher level officer of the firm stating that all electrical characteristics of the mechanical equipment to be supplied have been fully coordinated with the electrical contractor. No submittal will be checked until this letter is submitted. Any changes to the electrical requirements from the Contract Documents resulting from alternate equipment being submitted shall be borne by the Contractor and performed <u>without</u> any additions to the Contract Sum.
6. Shop Drawings shall be submitted for each of the following:
   a. HVAC Submittals:
      1) Air Handling Units (AHU) with fan, filter, sound and coil data
      2) Automatic Temperature Controls (including control diagrams, cuts of instrumentation, description of operation)
      3) Heating and Cooling Coils
      4) Air Cooled Condensing Units
      5) Electric Heating Equipment
      6) Ductwork Layout, Accessories and Details (min. 1/4"=1'0"scale)
      7) Fans With Sound Data and Performance Curves
      8) Fan Powered Induction Units (PIU) With Fan and sound data
      9) Test, Adjusting and Balancing Reports and Forms
      10) Variable Air Volume Units (VAV)

      Submit all attachment and fastening methods for piping and equipment to the Structural Engineer for approval.
   b. Plumbing Submittals:
      1) Air Compressor, Dryer, Filters and Accessories
      2) Backflow Preventors
      3) Double Wall Piping/Containment Systems
      4) Grease Interceptors
      5) Leak Detection and Monitoring Systems
      6) Plumbing Fixtures and Trim
      7) Pumps with Performance Curves
      8) Sewage Lift and Waste Water Pump Stations
      9) Pressure Booster Pump System
      10) Water Heaters

      Submit all attachment and fastening methods for piping and equipment to the Structural Engineer for approval.

c. Fire Protection Submittals:
   1) Backflow Preventor (Fire System)
   2) Fire Protection Shop Drawings with complete Hydraulic Calculations
   3) Fire Pump, Jockey Pump and Controllers
   4) Siamese Connection
   5) Sprinkler Heads and Escutcheons
   6) Test Header

   Submit all attachment and fastening methods for piping and equipment to the Structural Engineer for approval.

7. The Contractor shall electronically submit a preliminary sprinkler head layout for review and comment prior to design and layout of piping. The submittal shall consist of an electronic PDF (Portable Document Format) file with dimensioned sprinkler head layout for all areas with ceilings for approval prior to design and layout of piping. All lights, diffusers, detectors, speakers, soffits and other ceiling components shall be indicated on all drawings.

   Following approval of the sprinkler head layout submittal, the Contractor shall prepare one eighth (1/8") scale electronic PDF (Portable Document Format) file shop drawings for fire protection systems indicating pipe and fittings, cutting lengths, hydraulic calculations and node points, pipe sizes, locations, elevations, hangers, wall and floor penetrations and connections as well as all ceiling components noted previously. Include all information as required by NFPA 13, Item 22.1.3.

   Upon completion of fire protection work, submit to Owners' Underwriter/Insurance Agency and to the local authority having jurisdiction a certificate signed by an Officer of the Company which indicates that work has been tested in accordance with NFPA 13, NFPA 14, and NFPA 20 and also that the system is operational, complete, and has no defects. At project closeout, submit record drawings of installed fire protection piping and products; in accordance with requirements of Section 15010. Submit maintenance data and parts list for fire protection materials and products. Include this data, product data, shop drawings, approved installation drawings, approved calculations, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of Section 15010.

8. The Contractor shall electronically submit Composite Coordination Drawings of Above Ceiling areas of All Public and Back Of House Areas. The submittal shall consist of an electronic PDF (Portable Document Format) file with dimensioned layout (at a minimum ¼" = 1'- 0") for all areas with ceilings for approval prior to fabrication and installation. All Lights, Diffusers, Smoke Detectors, Speakers, Architectural Elements, Soffits, Pipe, Duct, Equipment, Conduit, and other trade components shall be indicated on all drawings. Each drawing submitted shall be signed and dated by the General and Trade Subcontractors indicating that they have assured themselves the installation can proceed without interference.

9. The Contractor shall submit two (2) copies of a letter, signed by an officer of the company that the items listed below meet or exceed criteria of the Plans and Specifications. The letter is to include a list of each item to be used on the project along with the manufacturer.

   a. HVAC Submittals:
      1) Flexible Duct
      2) Ductwork Access Doors and Panels
      3) Flexible Pipe Connectors
      4) Filters
      5) Vibration Isolators
      6) Ductwork Accessories
      7) Grilles, Registers and Diffusers
      8) Piping Identification Markers
      9) Valves

10) Thermal Insulation
11) Dampers
12) Louvers
13) Roof Curbs
14) Pipe Hangers and Supports

b. Plumbing Submittals:
1) Access Doors
2) Cleanouts
3) Drains and Drainage Accessories
4) Electric Heat Trace Cable
5) Fire Stopping Sealant
6) Fixture Carriers
7) Flexible Pipe Connectors
8) Flow Measuring Devices
9) Flow Switches
10) Gauge Cocks and Snubbers
11) Hose Bibbs
12) Level Gauges
13) Pipe and Fittings
14) Pipe Guides
15) Pipe Hangers and Supports
16) Piping Expansion Devices
17) Piping Identification Markers
18) Pressure and Temperature Gauges
19) Shock Absorbers
20) Steam Piping Accessories
21) Strainers
22) Test Wells
23) Thermal Insulation
24) Thermometers
25) Trap Primers
26) Vacuum Breakers
27) Valve Tags
28) Valves
29) Vibration Isolators
30) Wall Hydrants

c. Fire Protection Submittals:
1) Fire Hose Cabinets
2) Fire Valve Cabinets
3) Fire Stopping Sealant
4) Flow Switches
5) Pipe and Fittings
6) Pipe Hangers and Supports
7) Piping Identification Markers
8) Roof Manifold
9) Tamper Switches
10) Valve Tags

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Description

1. Complete bound operating and maintenance instructions shall be provided to the Owner. One electronic PDF (Portable Document Format) file shall be provided. Operating instructions shall be provided for each system, and shall include a brief system description, a simple schematic and a sequence of operation. Operating and maintenance instructions and all warranties shall be included for each piece of equipment. Manufacturers' Standard literature is acceptable for each piece of equipment. However, the Contractor shall prepare a SYSTEM O&M manual including overall system descriptions, operating and energy conservation techniques.
2. A system wiring and control diagram shall be included in the operating and maintenance instructions.

3.03 OTHER SUBMITTALS

A. Submit or provide the following at project closeout prior to occupancy of the project by the Owner:

1. Electronic PDF (Portable Document Format) file "As-built" record drawings for ductwork, HVAC piping, plumbing and fire protection systems.
2. Provide a combination pressure and temperature test plug kit to Owner.
3. Provide a spare seal and coupling for each pump labeled for their service and associated pump number.
4. Submit two (2) copies of welder’s certificate.
5. Submit two (2) copies of the vibration isolation manufacturer's certified letter of approval.
6. Submit two (2) copies of the certified water analysis chemical treatment performance tests to the Owner.
7. Provide a twelve (12) month supply of chemicals, chemical treatment procedures and schedule of visits to the Owner.
8. Submit two (2) copies of the certification of the disinfection of domestic water service.
9. Submit two (2) copies of certification that all pumps have been aligned and provide data to show that pumps were re-aligned after each was grouted. Certification shall come from manufacturer's representative.
10. Manufacturer's representative shall certify that HVAC equipment is installed in accordance with their recommendations.

END OF SECTION

SECTION 23 05 23 VALVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.03 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 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. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. 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.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Valves, Crane Co.; Crane Valve Group.
   b. Jenkins Valves, Crane Co.; Crane Valve Group.
   c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
   d. Hammond Valve.
   e. Jamesbury; a subsidiary of Metso Automation.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

B. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Hammond Valve.
   b. Jamesbury; a subsidiary of Metso Automation.
   c. Legend Valve.
   d. Marwin Valve; a division of Richards Industries.
   e. Milwaukee Valve Company.

2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Regular.

C. Three-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Jomar International, LTD.
b. Kitz Corporation.
c. Red-White Valve Corporation.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Three piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.03 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Valves, Crane Co.; Crane Valve Group.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Three-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. DynaQuip Controls.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corporation.

2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Three piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

2.04 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   l. Zy-Tech Global Industries, Inc.
2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: PTFE or TFE.

C. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Kitz Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corporation.
   i. Zy-Tech Global Industries, Inc.
2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

2.05 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Legend Valve.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Sure Flow Equipment Inc.
   l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-71, Type I.
   b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
   c. NPS 14 to NPS 24, CWP Rating: 150 psig.
   d. Body Design: Clear or full waterway.
   e. Body Material: ASTM A 126, gray iron with bolted bonnet.
   f. Ends: Flanged.
   g. Trim: Bronze.
   h. Gasket: Asbestos free.

2.06 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron.

B. Class 125, RS Bronze Gate Valves:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron.

2.07 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Flo Fab Inc.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Legend Valve.
   h. Milwaukee Valve Company.
   i. NIBCO INC.
   j. Powell Valves.
   k. Red-White Valve Corporation.
   l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
   c. NPS 14 to NPS 24, CWP Rating: 150 psig).
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged.
   f. Trim: Bronze.
   g. Disc: Solid wedge.
   h. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Flo Fab Inc.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Legend Valve.
   h. Milwaukee Valve Company.
   i. NIBCO INC.
   j. Powell Valves.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-70, Type I.
   b. NPS 2-1/2 to NPS 12N 65 to DN 300), CWP Rating: 200 psig.
   c. NPS 14 to NPS 24, CWP Rating: 150 psig.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged.
   f. Trim: Bronze.
   g. Disc: Solid wedge.
   h. Packing and Gasket: Asbestos free.

2.08 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Hammond Valve.
   d. Kitz Corporation.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Powell Valves.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded or solder joint.
   e. Stem and Disc: Bronze.
   f. Packing: Asbestos free.
   g. Handwheel: Malleable iron

B. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Hammond Valve.
   c. Kitz Corporation.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Powell Valves.
   g. Red-White Valve Corporation.
   h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: PTFE or TFE.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 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 all valves more than 84 inches above floor. Extend chains to 72 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
   3. Lift Check Valves: With stem upright and plumb.

3.03 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.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATION

System	Gate	Globe	Butterfly	Ball	Swing Check	Silent Check	Plug	Lift Check
Domestic Hot & Cold Water	*	*	*	*	*	*	*	
Compressed Air	*	*	*	*	*			*
Sprinkler & Fire Protection System	*		*	*	*			

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly (not hot water service), gate, or plug valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Globe, ball, butterfly valves.
4. Throttling Service, Steam: Globe or angle valves.
5. Pump Discharge Check Valves:
   a. NPS 2 and Smaller: Bronze swing check valves with nonmetallic disc.
   b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 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: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 6 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 6 and Larger: Flanged ends.
7. For Grooved-End Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.09 DOMESTIC HOT AND COLD WATER SERVICE:

A. Gate Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be Class 125, 200 psi WOG and shall have body and threaded bonnet of ASTM B-62 cast bronze composition, solid wedge disc, copper-silicon alloy stem, brass packing gland, solder ends, Teflon-impregnated packing, and malleable iron handwheel.

RISING STEM	NON-RISING STEM
Stockham B-108	Stockham B-104
Powell 1821	Powell 1822
Kitz 44	Kitz 41
Milwaukee 149	Milwaukee 115

2. Class 150, 300 psi WOG valves meeting the above specifications, with union bonnets shall be used where pressure requires.

RISING STEM
Stockham B-124
Powell N/A
Kitz 45
Milwaukee 1169

B. Ball Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be 600 psi CWP, have cast brass body, replaceable reinforced Teflon seat, conventional port, blowout proof stem, chrome-plated brass ball, solder ends with extended solder cups. Provide stem extension to insure handle clears insulation where provided on insulated pipe.

Stockham S-216-BR-R-S
Apollo 70-200
Kitz 57
Milwaukee "Butterball" BB2-350

C. Gate Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be Class 125, 200 psi WOG, iron body, bronze mounted solid wedge disc, with body and bolted bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly.

RISING STEM	NON-RISING STEM
Stockham G-623	Stockham G-612
Powell 1793	Powell 1787
Kitz 72	Kitz 75
Milwaukee F-2885-M	Milwaukee F-2882-M

D. Butterfly Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be lug type body, 200 psi CWP, conforming to ASTM A-395 ductile iron, replaceable EPDM sleeve, with ductile nickel-plated disc, 410 stainless steel stem, and EPDM O-ring stem seals. Sizes 2 inch – 6 inch shall be lever operated and 8 inch – 24 inch shall have gear operations.

Lever	Gear
Stockham LD-712-DS3-B	Stockham LD-722-DS3-B
Centerline Series LT	Centerline Series LT
Milwaukee ML132E	
Milwaukee ML132E	

E. Globe Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 125, 200 psi WOG, body and union bonnet of ASTM B-62 cast bronze composition, solder ends, composition disc, copper silicon alloy stem, brass packing gland, Teflon-impregnated packing and malleable iron handwheel.

   Stockham B-14-T
   Kitz 10
   Powell 1823

2. Class 150, 300 psi WOG valves meeting the above specifications shall be used where pressure requires.

   Stockham B-24T
   Powell 1823
   Kitz 10
   Milwaukee 1590T

F. Globe Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be of Class 125, 200 psi WOG, iron body, bronze mounted with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged end, with Teflon-impregnated packing and two-piece packing gland assembly.

   Stockham G-512
   Powell 241
   Kitz 76
   Milwaukee F2981-M

G. Check Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 125, 200 psi WOG, solder ends, with bodies and caps conforming to ASTM B-62 cast bronze composition, swing type bronze disc.

   Stockham B-309
   Powell 1825
   Kitz 23
   Milwaukee 1509

H. Check Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be Class 125, 200 psi WOG, iron body, bronze mounted, with body and bolted cap conforming to ASTM A-126 Class B cast iron, flanged ends, swing type bronze disc.

   Stockham G-931
   Powell 559
   Kitz 78
   Milwaukee F2974-M

I. Lubricated Plug Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 175 semi-steel body, full port, tapered teflon coated plug, lubricated under pressure, threaded or flanged ends conforming to ASTM A-126, Class B with adjustable memory stop, wrench operated.

   Powell 2200, 2201
   Nordstrom 115
   Walworth 1757-F

2. Class 200 valves meeting the above specifications shall be used where pressures require.

   Powell 2202
   Nordstrom 114
   Walworth 1754-F

J. Lubricated Plug Valves 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be of Class 175, semi-steel body, full port, tapered teflon coated plug, lubricated under pressure, flanged ends, conforming to ASTM A-126. Class B, with adjustable memory stop, wrench operated.

   Powell 2201
   Nordstrom 143
   Walworth 1760-F

2. Class 200 valves meeting the above specification may be used where pressure requires.

   Powell 2203
   Nordstrom 115
   Walworth 1757-F

K. Calibrated Balancing Valve:

1. Valves shall be of Class 125 at 250 degrees F, bronze body, leak tight ball construction. Valves to have differential pressure read out parts with check valves across the valve seat area. Valves to have memory stop feature to allow valve to be closed for service and reopened to set point without disturbing balance position. Valve shall be capable of metering to a minimum of 0.5 GPM. Valve shall have an attached calibrated nameplate to indicate degree of closure.

Bell and Gossett CB
TACO CS
Armstrong CBV

L. Temperature and Pressure Relief Valves:

1. Valves shall be A.G.A. temperature rated and ASME pressure rated and nameplate, and shall conform to ANSI Z21, 22. The operating limit of the relief valve shall not exceed 200 degrees F. Valve shall be bronze body, non-stick or freeze seat to disc alignment, fully automatic, self closing.

   Watts Series 40, 1450, 240 and 340
   A.W. Cash FV, Series
   Nibco

2.

Valves Size	Equipment Max. BTU/HR input
½ inch	15,000
¾ inch	200,000
1 inch	2,000,000
1½ inch	3,000,000

M. Pressure Reducing Valves – 2 inches and Smaller:

1. Valves shall be bronze body, screwed ends, renewable seat and disc, high temperature diaphragm for hot or cold water service, Y type strainer, water tight cage assembly, adjustable outlet pressure.

   Watts Regulators 223-SB
   Wilkins Regulator 500-YS-BR
   Mueller H-93000 Series
   A.W. Cash E-55 Series

N. Pressure Reducing Valves - 2-1/2 inches and Larger:

1. Valves shall be iron body, flanged ends, renewable seat and disc, high temperature diaphragm for hot or cold water service, Y type strainer, water tight cage assemble, pilot operated.

   A-W Cash Type B-70
   OCV Series 127
   Clayton 91-A or 91-G

O. Backflow Preventers:

1. Provide reduced pressure principle backflow preventers consisting of assembly including shutoff valves, strainer on inlet. Backflow preventers shall include test cocks, air-gap drain funnel, pressure differential relief valve located between two (2) positive seating check valves backflow preventer shall conform to ASSE Standard 1013.

   Watts Regulator 909
   Hersey Products FRP-11
   Wilkins 575-RP
   Clayton RP-1

P. Thermostatic Water Temperature Regulators:

1. Valves shall be of Class 125, bronze body for size 2 inches and smaller, iron body for size 2-1/2 inches and larger, bronze fitted, union screw or flanged ends, spring loaded packing, single seat, self operating, pilot actuated, 3-way mixing valve.

   Powers 11-WM
   ITT Lawler Type S
   Jordan Valve MK-89-MK

Q. Miscellaneous Valves:

1. Hose Bibbs: Hose bibbs shall be threaded end, bronze body, renewable composition disc, integral vacuum breaker, 1/2 NPT inlet, ¾ inch hose outlet.

   Chicago Faucet 5-T
   Royal Brass 5105
   Watts Regulator SC-6

2. Hose bibbs in mechanical rooms and building service areas shall be rough bronze body, lock shield, integral vacuum breaker, wall flange and threaded inlet, angle sillcock.

   Nibco 63-VB
   Watts Regulator SC-4
   Woodford 21-P

3. Hose bibbs in finished areas shall be chrome plated bronze body, lock shield, integral vacuum breaker, wall flange, loose key.

   Chicago Faucet 387
   Woodford 24-P
   Hammond

4. Freezeless hose bibbs at the building exterior shall be rough bronze body with integral vacuum breaker, wall flange and threaded inlet.

   Nibco 80-VB
   Hammond 58
   Woodford 17

R. Drain Valves:

1. Drain valves shall be threaded end, bronze body renewable composition disc, wheel handle, 3/4 NPT inlet, ¾ inch hose outlet.

   Nibco 73
   Watts Regulator BD-1
   Woodford 24

S. Hydrants:

1. Recessed, non-freeze, cast-bronze box, chrome plated face, loose tee handle key, bronze casting, length to suite wall thickness, vacuum breaker, hinged locking cover, ¾ inch inlet, hose outlet.

Josam 71000
Wade W-8625
Zurn, Hydromechanics Div., 1300

2. Floor level and yard non-freeze hydrants, bronze hydrant, rough bronze box tee handle key, bronze casting length to suite depth of bury, drain hole, vacuum breaker, hinged locking cover, ¾ inch inlet, hose outlet. Depth of bury shall be not less than 2 feet.

   Josam 6-71600
   Wade W-8609
   Zurn 1360

3. Hot and cold wall box hydrants shall be ¾ inch non-freeze type with bronze locking cover, hot and cold inlets, vacuum breaker and loose key. The box shall be deep enough to accommodate the vacuum breaker.

   Josam 71650
   Wade W-8606
   Zurn 1355

3.10 COMPRESSED AIR SERVICE:

A. Ball Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be 600 psi CWP, have cast brass bodies, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball, and threaded or solder ends with extended solder cups.

Threaded	Solder
Stockham S-216-BR-RT	Stockham S-216-BR-RS
Apollo 70-100	Apollo 70-200
Kitz 56	Kitz 57
Milwaukee BA-100	Milwaukee BA-150

B. Gate Valves - 2½ inches and Larger:

1. Valves 2-1/2 inches and larger shall be Class 125 iron body and bonnet, conforming to ASTM A-126 Class B cast iron, bronze mounted with Teflon o-ring in each seat, flanged end, with Teflon-impregnated packing and two-piece gland assembly.

   Stockham G-623-OR
   Powell 1793
   Milwaukee F-2885-M

C. Globe Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 150, body and bonnet of ASTM B-62 cast bronze composition, threaded ends, copper silicon alloy stem, replaceable Teflon disc, brass packing gland, Teflon-impregnated packing and malleable handwheel.

Stockham B-22	Kitz 02
Milwaukee 590T	Powell 150 A

D. Butterfly Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be lug type body, 200 psi CWP, conforming to ASTM A-126 Class B cast iron, field-reproducible Buna-N cartridge type sleeve, with ductile, nickel-plated disc, 410 stainless steel stem, and Buna-N O-ring stem seals. Sizes 2-6" shall be lever operated and 8-12" shall have gear operators.

Lever Operated	Gear Operated
Stockham LG-712-DS3-B	Stockham LG-722-DS3-B
Centerline Series LT	Centerline Series AA
Milwaukee ML132E	Milwaukee ML132E

E. Check Valves 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 150, 300 psi WOG, body and cap shall be of ASTM B-62 cast bronze composition, threaded ends, lift type, Teflon disc, spring loaded Buna-N disc.

Stockham B-322-TS
Walworth S-97
Lunkenheimer 233

F. Check Valves 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be Class 125/250, iron body bronze mounted, wafer check valve, with ends designed for flanged type connections, Buna-N seats, aluminum bronze disc, 316 stainless steel torsion spring, and hinge pin.

Stockham WG-970
Centerline CLC
APCO 9000

3.11 SPRINKLER AND FIRE PROTECTION SERVICE:

A. Gate Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be of Class 175, with body and bonnet conforming to ASTM B-62 cast bronze composition, threaded ends, OS&Y, solid disc, and listed by Underwriters Laboratories, Inc.

Stockham B-133
Kennedy 66
United 126-S

B. Gate Valves – 2-1/2 inches and Larger:

1. Valves 2-1/2 inches and larger shall be rated 175 psi WWP, iron body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, OS&Y, flanged or threaded end, and listed by Underwriters Laboratories, Inc.

Threaded	Flanged
Stockham G-633	Stockham G-634
Mueller A-2073-8	Mueller A-2073-6
Kennedy 67	Kennedy 68

C. Ball Valves – 2 inches and Smaller:

1. Valves 2 inches and smaller shall be constructed of commercial brass rod, with Teflon seats, blowout proof stem, and listed by Underwriters Laboratories, Inc. for fire protection service.

   Stockham US-124-BR-RT
   Milwaukee Butterball – UL
   Nibco

D. Gate Valves for Indicator Post – 4 inches and Larger:

1. Valves for Underground Bury shall be of Class 175, with body and bonnet conforming to ASTM A-126 Class B cast iron, bronze mounted, non-rising stem, flanged ends, with mounting plate for indicator post and listed by Underwriters Laboratories, Inc.

   Stockham G-623-0
   Nibco F-609
   Kennedy 704-X
   Mueller A-2052-6

2. When required, a vertical indicator post may be used on underground valves. Posts must provide a means of knowing if valve is open or shut. Indicator posts must be listed by Underwriters Laboratories, Inc.

Wall Indicator	Post Indicator
Stockham G-950	Stockham G-951
Kennedy 541-13	Kennedy 541-20-2
Mueller A-20810	Mueller A-20800

E. Butterfly Valve – 4 inch Through 12 inch:

1. In lieu of gate valves, butterfly valves, may be substituted for gate valves, where appropriate. Valves shall be rated for 175 PSIG working pressures, as listed by Underwriters Laboratories, Inc.

2. Valves furnished may have ductile iron (nickel-plated) discs or aluminum bronze discs, depending upon the local water conditions. In addition, either wafer or lug style bodies may be specified, depending upon the system needs. Sleeves shall be EPDM.

3. Ductile Iron Discs

Wafer	Lug
Stockham LG-52U-DS3E	Stockham LG-72U-DS3-E
Kennedy NE-H	Kennedy NE-H
Kitz	Kitz

4. Aluminum Bronze Discs

Wafer	Lug
Stockham LG-520-BS3-E	Stockham LG-72U-BS3-E
Kennedy 911-UL-WE	Kennedy 911-UL-LE
Kitz	Kitz

5. Monitor or tamper switches are specified as required.

6. Butterfly valves may be specified for underground service. Post indicators must be specified with proper post length.

F. Gate Valves High Rise Service 2-1/2 inch – 12 inch:

1. Valves 2-1/2 inch – 10 inch shall be rated 300 psi WWP, 12 inch shall be rated 250 psi WWP, iron body, bronze mounted, with body and bonnet conforming to ASTM-A-126 Class B Cast Iron, OS&Y flanged end and listed by the Underwriters Laboratories, Inc.

   Stockham F-670
   Kennedy 3068
   Crane

G. Check Valves – 2-1/2 inch and Larger:

1. Valves 2-1/2 inch and larger shall be 175 psi WWP, bolted cap, with body and cap conforming to ASTM, A-126 Class B cast iron, flanged end, with composition swing type disc and listed by Underwriters Laboratories, Inc.

   Stockham G-940
   Kennedy 126-A
   Crane

3.17 GENERAL

A. Automatic air vents shall be installed with gate valves.

B. Provide gate, globe and check valves throughout the piping systems where shown and where necessary to properly regulate and control the systems. Valves shall be the full size of the lines and shall be designed for low pressure drop.

C. Adjust pressure reducing valve serving compression tanks to maintain between 5 and 10 psig at the highest point in the system.

END OF SECTION

SECTION 23 05 29 HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following hangers and supports for HVAC, plumbing and fire protection piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include but are limited to the following:

1. Division 23 0548 Section "Vibration Isolation" for vibration isolation devices.
2. Division 22 116 Section "Domestic Water Piping" for pipe hangers for domestic water piping.
3. Division 22 1316 Section "Sanitary Waste and Vent Piping" for pipe hangers for sanitary piping.
4. Division 22 1413 Section "Storm Drainage Piping" for pipe hangers for storm drainage piping.
5. Division 23 2113 Section "Hydronic Piping and Accessories" for pipe hangers for hydronic piping.
6. Division 21 1313 Section "Fire Protection" for pipe hangers for fire protection piping.
7. Division 23 3113 Section “Ductwork and Accessories” for duct hangers and supports.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

A. All piping and equipment shall be supported square with, perpendicular to and/or parallel with building structural and architectural elements.

B. Furnish hangers to support the required loads. Where necessary, supports shall be designed to permit movement due to expansion and contraction. Where Drawings show details of supports and anchors, conform to details shown. Where details are not shown, conform to general requirements specified herein.

C. Install lateral bracing with pipe hangers and supports to prevent swaying in all piping systems.

D. Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

E. Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

F. Support design for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water are covered under this section.

G. Equipment support design capable of supporting combined operating weight of supported equipment and connected systems and components are covered under this section.

H. Seismic restraint hangers and supports for piping and equipment with the requirements for obtaining approval from authorities having jurisdiction are covered under this section.

I. Unrestrained “C” clamps shall not be used to support piping systems covered by this section from the structure above.

J. Do not pierce any waterproofing installation or insulation vapor barrier with supports or support bolts.

K. All ferrous metal hangers, supports and rods shall be cadmium plated or galvanized. Field painting of hangers, supports or rods is unacceptable.

1.05 SUBMITTALS

A. Product Data for the following is required:

1. Steel pipe hangers and supports.
2. Thermal hanger shield inserts.
3. Powder actuated fastener systems.(Structural engineer approval required)
4. Pipe positioning systems.

B. Shop Drawings shall be signed and sealed by a qualified professional engineer. They shall show the fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers including Product Data for components.
2. Metal framing systems including Product Data for components.
3. Pipe stands including Product Data for components.
4. Equipment supports.

C. Welding certificates for proposed welders.

1.06 QUALITY ASSURANCE

A. Welding procedures and personnel shall be qualified according to AWS D1.1, "Structural Welding Code--Steel."

B. All hangers, support, anchors, and guides shall be in accordance with the American National Standard Code for Pressure Piping, ANSI/B31.1 with Addenda 31.1 OA and Federal Specification WW-H-171E.

C. Provide an adequate suspension system in accordance with recognized engineering practices using standard commercially accepted pipe hangers and accessories.

D. Horizontal suspended pipe shall be hung using adjustable pipe hangers with bolted hinged loops or turnbuckles. Chains, wire, perforated strap iron or flat steel straps are not acceptable.

E. Prior to submittal to Architect/Engineer, submit fastening methods to the Architect for approval by the Structural Engineer. Forward an approved copy to the Architect/Engineer for review.

PART 2 - PRODUCTS

2.01 STEEL PIPE HANGERS AND SUPPORTS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Anvil
2. B-Line Systems, Inc.; a division of Cooper Industries.
3. Carpenter & Paterson, Inc.
4. ERICO/Michigan Hanger Co.
5. Globe Pipe Hanger Products, Inc.
6. National Pipe Hanger Corporation.

B. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" for where to use specific hanger and support types.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with other pipe insulation pad or cushion for support of bearing surface of piping.

2.02 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.

2.03 METAL FRAMING SYSTEMS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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.

B. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.04 THERMAL HANGER SHIELD INSERTS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.

B. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or 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 3 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.05 FASTENER SYSTEMS

A. Subject to compliance with requirements and with the approval of the Structural Engineer, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. 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 approved by the Structural Engineer for use.

C. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension and shear capacities appropriate for supported loads and building materials where approved by the Structural Engineer for use.

2.06 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the named manufacturers.Coordinate subparagraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.
2. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the named manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the named manufacturers:
   a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the named manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
2. Base: Plastic.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the named manufacturers:
   a. Portable Pipe Hangers.
2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.07 PIPE POSITIONING SYSTEMS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

B. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

2.08 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.09 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, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HVAC 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.

3.02 DOMESTIC WATER / FIRE PROTECTION PIPE HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation shall 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.

1. Pipes of Various Sizes can be supported together and trapezes spaced for smallest pipe size or Contractor shall 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 (Structural Engineer approval required):

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick 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 published operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's published written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 7 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation shall be fabricated from welded-structural-steel shapes.

J. 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.

K. 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 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.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

N. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   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 B31.1 for power piping and 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.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 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.

O. Domestic cold, hot, hot water return, fire protection, gas, compressed air, drainage, vacuum, fuel oil, waste and vent piping.

1. Upper Attachments: Support piping in new concrete construction with adjustable type inserts.
   a. Anvil Figure 282
   b. B-Line Figure B3014 and B3014N
   c. Elcen Figure 65
2. Where hangers are required between structural members, provide side beam brackets attached to the upper 1/3 of the beam, and all auxiliary steel for the installation of the pipe hangers. Supports shall be designed in accordance with the AISC Steel Handbook.
   a. Anvil Figure 202
   b. B-Line Figure B3062
   c. Elcen Figure 27
3. Support piping in existing concrete construction with cadmium plated, malleable iron, expansion case anchor.
   a. Anvil Figure 117
   b. B-Line Series LA
   c. Elcen Figure 212
4. Support piping in new and existing steel construction with adjustable beam clamps or welded beam attachment with threaded rods.
   a. Anvil Figure 218 Anvil Figure 66
   b. B-Line Figure B3054 B-Line Figure B3083WO
   c. Elcen Figure 95 and 76
5. Support piping from steel joist construction with all threads rods and square steel washer plate with double nuts top and bottom.
   a. Anvil Figure 60
   b. B-Line Figure B3134W
   c. PHD Figure 930
6. Where hangers are required between structural members (beams or joists) provide a welded steel bracket sized to meet the constraints of the structural installation. The bracket shall be attached with a continuous weld between the support and the structural member. Supports shall be designed in accordance with the AISC Steel Handbook.
   a. Anvil Figure 195
   b. B-Line Figure B3066
   c. Elcen Figure 57

7. Pipe Attachments: Hangers for horizontal piping shall be clevis type with vertical adjustment. Hangers for insulated pipes shall be selected to bear on the outside of the insulation.
   a. Anvil Figure 260
   b. B-Line Figure B3100
   c. Elcen Figure 12
8. Hangers for horizontal fire protection piping only shall be adjustable swivel ring type, U.L. listed and Factory Mutual approved.
   a. Anvil Figure 70
   b. B-Line Figure B3170NF
   c. PHD Figure 151
9. Hangers for multiple horizontal piping systems shall be trapeze type.
   a. Anvil Figure 46
   b. B-Line Figure B22
   c. Unistrut Model P3200
   d. Michigan Hanger Figure 380
10. Provide an insulation protection shield between all hangers and the pipe insulation.
    a. Anvil Figure 167
    b. B-Line Figure B3151
    c. Elcen Figure 400
11. Wall Supports: Where piping is run adjacent to masonry walls or steel columns welded steel brackets may be used. The bracket shall be bolted to the wall with a back plate or welded to a mounting flange then attached to the wall or column. The back plate or flange shall be of such size and thickness as to distribute the weight properly.
    a. Anvil Figure 195
    b. B-Line Figure B3066
    c. Elcen Figure 57
12. Insulated pipe shall be provided with a protection shield between the hanger and the pipe insulation.
    a. Anvil Figure 167
    b. B-Line Figure B3151
    c. Elcen Figure 400
13. Floor Supports: Where pipe runs are located next to the floor, the pipe shall be supported with an adjustable pipe saddle support and floor flange.
    a. Anvil Figure 264
    b. B-Line Figure B3092
    c. Elcen Figure 50
14. Vertical piping shall be supported at every floor using riser clamps. Provide a steel plate and neoprene sandwich type pad at each riser clamp for support.
    a. Anvil Figure 261
    b. B-Line Figure B3373
    c. Elcen Figure 1
15. Chase Supports: Support domestic hot and cold water piping and waste and vent piping in wall or chase spaces behind plumbing fixtures with manufactured brackets and plastic or copper grip clamp systems.
    a. Bee Line Ruff-in Series
    b. Sioux Chief Hold Rite
    c. Hubbard Enterprises, Holdrite

3.03 SANITARY / STORM PIPE HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 23 0548 "Vibration and Isolation."

B. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support each horizontal length of NO-HUB cast iron pipe within one foot (1'-0") of each joint and a maximum of ten feet (10'-0") on centers, and as required to maintain alignment and prevent sagging. Pipe shall be supported and anchored in accordance with manufacturers' recommendations.

D. Provide a hanger within one foot (1-0") of each elbow.

E. Support vertical piping and tubing at base and at each floor.

F. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install supports for vertical steel piping every 15 feet.

I. Install supports for vertical stainless-steel piping every 10 feet.

J. Install supports for vertical copper tubing every 10 feet.

K. Install supports for vertical PVC piping every 48 inches.

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.04 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.

3.05 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for 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.

3.06 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.07 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.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.10 INSTALLATION:

A. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

B. Support horizontal equipment such as in-line pumps, strainers, and air separators independently of the piping system.

C. Hang pipe from substantial building structure. Pipe shall <u>not</u> be hung from other piping, ductwork, ceiling, steel decking, or any other building component.

D. All vertical piping shall be supported at every floor using riser clamps. All vertical piping in highrise applications or above 5 stories shall be supported at every other floor using spring-type riser clamps. All vertical piping drops along columns or walls shall be secured at the top and bottom of the drop and every ten feet (10'-0") on center.

E. Provide a hanger within one foot (1-0") of each riser horizontal offset in addition to the riser clamp support at every floor.

F. Support all fire protection piping independently of all other piping. Reference Specification Section 15500 for additional details.

G. All copper tubing shall be isolated from steel supports, anchors and metal studs to prevent electrolysis. Isolate piping with neoprene pads or plastic inserts. Tape (duct or electrical) shall not be used to isolate piping.

H. Spacing of hangers and supports for above ground horizontal piping shall be as follows:

Type	Pipe Size	Maximum Span	Rod Size
Steel			
	3/4	7	3/8
	1	7	3/8
	1 ¼	7	3/8
	1 ½	9	3/8
	2	10	3/8
	2 ½	11	1/2
	3	12	1/2
	4	13	5/8
Copper			
	3/4	5	3/8
	1	6	3/8
	1 ¼	7	3/8
	1 ½	8	3/8
	2	8	3/8

Type	Pipe Size	Maximum Span	Rod Size
Plastic			
	3/4	5	3/8
	1	5	3/8
	1 ¼	5	3/8
	1 ½	4	3/8
	2	4	3/8
	2 ½	4	1/2
	3	4	1/2
	4	4	5/8
Cast Iron			
	2	5	3/8
	3	5	1/2
	4	5	5/8
	6	5	3/4

Notes:

A. Plastic Piping Hanger Spacing: A Space hanger according to pipe manufacturer's published instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
B. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.
C. Verify actual supported loads for hanger sizes and spacing.
D. Consult Structural Engineer for any attachment / loading requirements.
E. Spacing and sizes are from MSS SP-69.
F. Spacing of less than shown may be required to conform with building structure loading limitations and standard product load ratings.

END OF SECTION

SECTION 23 05 48 VIBRATION ISOLATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Spring isolators.
5. Housed spring mounts.
6. Vibration isolation equipment bases.

1.03 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Coordination Drawings: Show coordination of bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports.

C. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATORS

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. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.02 VIBRATION ISOLATION EQUIPMENT BASES

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. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
   a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
   a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.03 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by Indicate on Drawings, by details, schedules, or a combination of both, the locations where hanger rods for individual pipes and hanger rods for trapeze hangers require hanger rod stiffeners.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

3.03 VIBRATION-CONTROL INSTALLATION

A. Equipment Restraints:

1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inches.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors (Used only with the Structural Engineers approval):

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 FIELD QUALITY CONTROL

A. Testing Agency Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. Air-Mounting System Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
10. Air-Mounting System Operational Test: Test the compressed-air leveling system.
11. Test and adjust air-mounting system controls and safeties.
12. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.05 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of sprint isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 23 05 53 IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system, to be included in maintenance manuals.

1.04 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

1.05 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Craftmark
2. Marking Services, Inc.
3. Seton

4. W.H. Brady Company

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160°F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. 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.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch 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.

2.02 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160°F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive. Where pipe diameter exceeds the size of precoiled bands, label fasteners shall be used to attach label to pipe surface.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations as noted in Section 3.03 of this Specification. Pipe label shall include an arrow indicating flow direction. Piping which also is provided with electric heat tracing shall have “Electric Traced” added to description.

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 high.

E. Piping color coding shall comply with ANSI A13.1 Standard for Pipe Marking.

2.04 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160°F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.05 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8 ½" by 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.06 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Reinforced grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers and paints.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. 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 along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Visibility: Where pipe lines are located above or below the normal line of vision, the lettering shall be placed above or below the horizontal centerline of the pipe, to insure ease of visibility.

C. Label and letter size:

1. Label and letter sizes shall conform to ANSI A13.1 standard of identification of piping systems according to the following table:

O.D. of Pipe Or Covering	Length of Color Field	Size of Letters
1 1/4 inches to 3/4 inch	8 inches	1/2 inch
1 1/2 inches to 2 inches	8 inches	3/4 inch
2 1/2 inches to 6 inches	12 inches	1 1/4 inches

2. For identification of piping less than 3/4 inches in diameter, use a permanently legible metal tag.

D. Pipe Label Legend and Color Schedule:

Pipe Label	Legend	Background	Letter Color
Cold Water (Domestic)	CW	White	Green
Compressed Air	AIR	Black	Yellow

Condensate Drain	CD	White	Green
Drain	D	White	Green

Pipe Label	Legend	Background	Letter Color
Fire Standpipe	FSP	White	Red
Grease Vent	GV	White	Green
Grease Waste	GW	White	Green
Hot Water (Domestic)	HW	Black	Yellow
Hot Water Recirculation	HWR	Black	Yellow
Indirect Waste	IW	White	Green
Pipe Label	Legend	Background	Letter Color
Refrigerant Liquid	RL	Black	Yellow
Refrigerant Suction	RS	Black	Yellow
Sanitary Drain	SAN	White	Green
Sanitary Vent	SAN V	White	Green
Standpipe	SP	White	Red
Storm Drain	ST	White	Green
Storm Drain – Emergency	EST	White	Green

3.04 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Green: For exhaust, outside, relief, return, and mixed air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter concealed spaces/shafts and at maximum intervals of 125 feet in each space where ducts are exposed or concealed by removable ceiling system. Where the roof is penetrated each duct shall be labeled with minimum 6” high letters.

3.04 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

3.05 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

Floor Level	Room Number	Valve Tag No	Function	Valve Type	Area Under Control	Manufacturer / Model No.	Valve Size	Valve Rating	Normal Valve Position
1st	1234	H-0100	Shut-Off	Ball	List	Apollo A100	2 inches	125 psig / 210° F	N.O.

B. Valve Schedule – Sample Chart for Reference

Column Explanations:

Floor Level – Level as provided by Owner

Room Number – Number taken from latest Architectural Drawing
Valve Tag Number – Valve tag naming convention assigned by Contractor and approved by Owner /Engineer
Function – Valve function or use, i.e. shut-off, bypass, etc.
Valve Type - Self explanatory
Area Controlled – Building area affected if the valve is opened or closed
Manufacturer/Model- Self explanatory
Valve Size - Self explanatory
Valve Rating - Self explanatory
Normal Position – Valve position during normal operation (NO = Normally Open)

END OF SECTION

SECTION 23 05 93 TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
   a. Constant-volume air systems.
   b. Variable-air-volume systems.

1.03 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.

1.04 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. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. 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.

1.05 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.

B. TAB Conference: Meet with Architect, Engineer, Construction Manager and Commissioning Authority 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.

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. TAB Report Forms: Use standard TAB contractor's forms approved by Architect, Engineer, Construction Manager and Commissioning Authority].

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.06 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.07 COORDINATION

A. Notice: Provide seven (7) 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

3.01 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 used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "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 operating safety interlocks and controls on HVAC equipment.

L. 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.

3.02 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. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.

5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.03 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" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, 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. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

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.

3.04 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 Division 23 Section "Metal Ducts."

3.05 PROCEDURES FOR CONSTANT-VOLUME 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 terminal outlets and inlets and calculate the total airflow.
2. Measure fan static pressures as follows to determine actual static pressure:
   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 Architect, Construction Manager and Commissioning Authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 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.

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.

3.06 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
   a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

3.07 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.

3.08 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.09 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.

3.10 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.

3.11 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.
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 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. Face and bypass damper settings at coils.
      e. Fan drive settings including settings and percentage of maximum pitch diameter.
      f. Inlet vane settings for variable-air-volume systems.
      g. Settings for supply-air, static-pressure controller.
      h. 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. Water and steam flow rates.
   3. Duct, outlet, and inlet sizes.
   4. Pipe and valve sizes and locations.
   5. Terminal units.
   6. Balancing stations.
   7. 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, and bore.
   i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   j. Number, make, and size of belts.
   k. Number, type, and size of filters.
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, and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Outdoor airflow in cfm.
   f. Return airflow in cfm.
   g. Outdoor-air damper position.
   h. Return-air damper position.
   i. Vortex damper position.

F. 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.
   e. Number of stages.
   f. Connected volts, phase, and hertz.
   g. Rated amperage.
   h. Air flow rate in cfm.
   i. Face area in sq. ft.
   j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):
   a. Heat output in Btu/h.
   b. Air flow rate in cfm.
   c. Air velocity in fpm.
   d. Entering-air temperature in degrees F.
   e. Leaving-air temperature in degrees F.
   f. Voltage at each connection.
   g. Amperage for each phase.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
   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, and bore.
   h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
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, and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg.

H. 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.
   d. Duct static pressure in inches wg.
   e. Duct size in inches.
   f. Duct area in sq. ft.
   g. Indicated air flow rate in cfm.
   h. Indicated velocity in fpm.
   i. Actual air flow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Apparatus used for test.
   d. Area served.
   e. Make.
   f. Number from system diagram.
   g. Type and model number.
   h. Size.
   i. Effective area in sq. ft.
2. Test Data (Indicated and Actual Values):
   a. Air flow rate in cfm.
   b. Air velocity in fpm.
   c. Preliminary air flow rate as needed in cfm.
   d. Preliminary velocity as needed in fpm.
   e. Final air flow rate in cfm.
   f. Final velocity in fpm.
   g. Space temperature in deg F.

J. Instrument Calibration Reports:

1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.12 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.
2. Check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   c. Verify that balancing devices are marked with final balance position.
   d. Note deviations from the Contract Documents 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 Architect, Construction Manager and Commissioning Authority.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect, Construction Manager and Commissioning Authority.

3. Architect, Construction Manager and 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.

3.13 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.

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

SECTION 23 07 13 THERMAL INSULATION FOR MECHANICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Cellular glass.
   b. Flexible elastomeric.
   c. Mineral fiber.
2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Lagging adhesives.
7. Sealants.
8. Jackets.
9. Tapes.
10. Securements.

B. Related Sections:

1. Division 23 Section "Mechanical General".
2. Division 23815 Section "Metal Ducts" for duct liners.

1.03 DESCRIPTION

A. All insulation products shall meet NFPA requirements for Flame Spread Rating 25, Smoke Developed Rating 50, and Fuel Contributed 50.

B. Staples shall not be used for securing insulation. Insulation and vapor barrier shall be continuous through wall, ceiling, floor and roof openings and sleeves, except at fire/smoke dampers.

C. Supports for insulated piping shall be outside the insulation. Inserts shall be provided at hangers. Inserts shall be Foamglas® Insulation, Calcium Silicate or Perlite and shall be two (2") inches longer than the pipe shields. Pipe shoes welded to the pipe shall be used for roll type hangers.

D. All tests shall be completed before insulation is applied.

E. Do not store materials in building until it is enclosed and dry. Wet insulation shall not be installed.

F. Insulation products with self-sealing type jacket shall not be applied at temperatures below 40 degrees F.

G. Items not to be insulated:

1. Chromium plated brass connections to plumbing fixtures.
2. Underground domestic cold water piping.
3. Piping installed in enclosures for:
   a. Unit heaters
4. Vents from pressure relief valves.
5. Ducts with internal lining or factory insulated ducts.

H. Clean and dry all surfaces to be insulated from loose scale, dirt, oil, water and other foreign matter.

I. Pipes shall be painted with one (1) coat of rust inhibiting primer before installing insulation.

J. Insulate completely all metal surfaces of piping, ductwork and equipment other than hangers.

K. Surface finishes shall present a tight smooth appearance.

L. Permit expansion and contraction without causing damage to insulation or surface finish.

M. Surface finish shall be extended to protect all surfaces, ends, and raw edges of insulation.

N. Vapor barriers on pipe and duct insulation must be continuous and uninterrupted throughout the system except where fire dampers occur.

1.04 SUBMITTALS

A. First four paragraphs below are defined in Division 1 Section "Submittal Procedures" as "Action Submittals."

B. Product Data for each type of product indicated shall be submitted and include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

C. 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.

D. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. 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.

C. Codes and regulations referred to are minimum standards. Where the requirements of these Specifications or Drawings exceed those of the codes and regulations, the Drawings and Specifications shall govern.

D. Any methods of application of insulation materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations. Insulation shall be applied by experienced workers regularly employed for this type of work.

E. Material shall be furnished to the job bearing the manufacturer's label.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.07 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and 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.

1.08 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.

1.09 PIPING:

A. Insulate all valves, strainers and fittings. For the purposes of this Specification, fittings include unions and flanges. Use pre-molded material where available.

B. Insulate valves up to and including bonnets.

1.10 DUCTWORK:

A. Insulation shall cover all standing seams and metal surfaces. Materials shall be applied subject to their temperature limits.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. 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.

C. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

D. 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 "Jackets" Article.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

2.02 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.
c. Fosters Insulation Mfg. Co., Inc.; Quickcote

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.
b. Fosters Insulation Mfg. Co., Inc.; Quickcote
c. P. K. Insulation Mfg. Co., Inc.; Super-stik

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, 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.

2.04 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 degrees F to plus 180 degrees F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Products, Division of ITW; CP-30.
   b. Foster Products Corporation, H. B. Fuller Company; 30-35.
   c. ITW TACC, Division of Illinois Tool Works; CB-25.
   d. Marathon Industries, Inc.; 501.
   e. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 degrees F to 180 degrees F.
4. Solids Content: ASTM D 1644, 44% by volume and 62% by weight.
5. Color: White.
   a. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

2.05 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Childers Products, Division of ITW; CP-52.
   c. Foster Products Corporation, H. B. Fuller Company; 81-42.
   d. Marathon Industries, Inc.; 130.
   e. Mon-Eco Industries, Inc.; 11-30.
   f. Vimasco Corporation; 136.
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 degrees F to plus 180 degrees F.
4. Color: White.

2.06 FACTORY AND FIELD APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

D. See EXECUTION section for jacket thicknesses.

1. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
   b. Compac Corp.; 104 and 105.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   b. Compac Corp.; 110 and 111.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
   d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.09 SECUREMENTS

A. Bands:

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316]; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; CD.
      3) Midwest Fasteners, Inc.; CD.
      4) Nelson Stud Welding; TPA, TPC, and TPS.
2. Self-Sticking-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. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
      2) GEMCO; Press and Peel.
      3) Midwest Fasteners, Inc.; Self Stick.
   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.
3. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
   a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) GEMCO.
      2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. C & F Wire.
   b. Childers Products.
   c. PABCO Metals Corporation.
   d. RPR Products, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment 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.

3.02 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 applies 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.

3.03 GENERAL INSULATION INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, 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, duct system, 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. 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 beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.04 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 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 and polyolefin, 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.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

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 with finishing cement, mastic, and flashing sealant.

3.05 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated) shall be continuous through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations shall be continuous through penetrations of fire-rated walls and partitions. 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.

3.06 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 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, 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.

E. 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 and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches 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 overcompress 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 from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch 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°F at 18-foot 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 2 times the insulation thickness but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches 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- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.08 WEATHERPROOFING

A. Protect piping and duct insulation exposed to weather outside the building with Pabco Insulating Division corrugated aluminum sheets of 0.024 thickness (22 gauge). Piping joints shall have aluminum formed elbows with leak proof beads and epoxy coated interior.

3.09 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

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 PVC jackets.

3.10 INDOOR JACKET SCHEDULE

A. Install jacket over insulation material.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.

E. Equipment, Concealed:

1. None.

F. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Smooth: 26 gauge (0.016 inch thick).

G. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. None.
2. Aluminum, Smooth with 4-by-1-Inch Box Ribs: 26 gauge (0.016 inch thick).

H. Piping, Concealed:

1. None.

I. Piping, Exposed:

1. Aluminum, Smooth: 26 gauge (0.016 inch thick).
2. Stainless Steel, Type 304 or 316, Smooth 2B Finish: 24 gauge (0.020 inch thick).

J. Piping, Exposed in Mechanical Rooms and below 7'-0" from floor line:

1. Aluminum, Corrugated with Z-Shaped Locking Seam: 20 gauge (0.032 inch thick).

3.11 INSULATION SCHEDULE

PRE-MOLDED FIBER GLASS PIPE INSULATION:

INSULATION THICKNESS IN INCHES FOR PIPE SIZES					
Plumbing	Temperature Up to	up to 1 inch	1-1/4 inches to 2 inches	2-1/2 inches to 3-1/2 inches	4 inches & Over
Hot Water and Hot Water Circulating	200 degrees F	1-2 inches	1 inch	1 inch	1 1/2 inches
Cold Water	50-65 degrees F	1/2 inch	1 inch	1 inch	1 inch
Refrigerant Hot Gas and Liquid – interior locations	Any	3/4 inch	1 inch	1 1/2 inches	--
Refrigerant Suction – interior locations	Any	3/4 inch	1 inch	1 1/2 inches	--

FLEXIBLE ELASTOMERIC PIPE INSULATION:

INSULATION THICKNESS IN INCHES FOR PIPE SIZES					
	Temperature Up to	up to 1 inch	1-1/4 inches to 2 inches	2-1/2 inches to 3-1/2 inches	4 inches & Over
Refrigerant Hot Gas and Liquid – exterior locations	Any	3/4 inch	1 inch	1 1/2 inches	--
Refrigerant Suction – exterior locations	Any	3/4 inch	1 inch	1 1/2 inches	--

MINERAL FIBER BLANKET INSULATION:

DUCT INSULATION THICKNESS IN INCHES					
Supply Air					2 inches
Outside Air					2 inches
Return Air					2 inches
Factory Insulated					0 inches

END OF SECTION

SECTION 23 09 00 HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

1.03 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.04 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
   a. Space Temperature: Plus or minus 1 deg F.
   b. Ducted Air Temperature: Plus or minus 1 deg F.
   c. Outside Air Temperature: Plus or minus 2 deg F.
   d. Dew Point Temperature: Plus or minus 3 deg F.
   e. Temperature Differential: Plus or minus 0.25 deg F.
   f. Relative Humidity: Plus or minus 5 percent.
   g. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
   h. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
   i. Airflow (Terminal): Plus or minus 10 percent of full scale.
   j. Air Pressure (Space): Plus or minus 0.01-inch wg.
   k. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
   l. Electrical: Plus or minus 5 percent of reading.

1.05 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers / transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:
   a. Wiring diagrams for control units with termination numbers.
   b. Schematic diagrams and floor plans for field sensors and control hardware.
   c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.

10. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

D. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with LonWorks.

E. Samples for Initial Selection: For each color required, of each type of sensor cover with factory-applied color finishes.

F. Samples for Verification: For each color required, of each type of sensor cover.

G. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

H. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

I. Field quality-control test reports.

J. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.06 QUALITY ASSURANCE

A. Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.08 COORDINATION

A. Coordinate location of thermostats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

C. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

D. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replacement Materials: One replacement diaphragm or relay mechanism for each unique sensor.
2. Maintenance Materials: One thermostat adjusting key(s).

PART 2 - PRODUCTS

2.01 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.

2.02 CONTROL SYSTEM

A. Manufacturers:

1. Honeywell International Inc.; Home & Building Control.
2. Johnson Controls, Inc.; Controls Group.
3. Siemens Building Technologies, Inc.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

D. Control system shall include the following:

1. Building intrusion detection system specified in Division 13 Section "Intrusion Detection."
2. Building clock control system specified in Division 13 Section "Clock and Program Control."
3. Building lighting control system specified in Division 13 Section "Lighting Controls."
4. Fire alarm system specified in Division 13 Section "Fire Alarm."

2.03 DDC EQUIPMENT

A. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
   a. Global communications.
   b. Discrete/digital, analog, and pulse I/O.
   c. Monitoring, controlling, or addressing data points.
3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink / physical layer protocol.
5. LonWorks Compliance: Control units shall use LonTalk protocol and communicate using EIA/CEA 709.1 datalink / physical layer protocol.

B. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

C. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

D. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.04 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
4. LonWorks Compliance: Communicate using EIA/CEA 709.1 datalink/physical layer protocol using LonTalk protocol.
5. Enclosure: Dustproof rated for operation at 32 to 120 deg F.
6. Enclosure: Waterproof rated for operation at 40 to 150 deg F.

2.05 ALARM PANELS

A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch-thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish. Provide common keying for all panels.

B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.

1. Alarm Condition: Indicating light flashes and horn sounds.
2. Acknowledge Switch: Horn is silent and indicating light is steady.
3. Second Alarm: Horn sounds and indicating light is steady.
4. Alarm Condition Cleared: System is reset and indicating light is extinguished.
5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.06 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.

1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig.
2. Proportional band shall extend from 2 to 20 percent for 5 psig.
3. Authority shall be 20 to 200 percent.
4. Air-supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal of zero to supply pressure.
5. Gages: 3-1/2 inches in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.07 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. Ebtron, Inc.
   c. Heat-Timer Corporation.
   d. I.T.M. Instruments Inc.
   e. MAMAC Systems, Inc.
   f. RDF Corporation.
2. Accuracy: Plus or minus 0.5 deg F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
   d. Color: Selection by Architect
   e. Orientation: Vertical.
8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. Room Sensor Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Concealed.
2. Set-Point Indication: Concealed.
3. Thermometer: Concealed.
4. Color: Selection by Architect.
5. Orientation: Vertical.

D. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.
2. Guards: Locking; heavy-duty, transparent plastic; mounted on separate base.
3. Adjusting Key: As required for calibration and cover screws.

2.08 STATUS SENSORS

2.09 THERMOSTATS

A. Manufacturers:

1. Erie Controls.
2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
3. Heat-Timer Corporation.
4. Sauter Controls Corporation.
5. Theben AG - Lumilite Control Technology, Inc.

B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.

1. Label switches "FAN HIGH-MED-LOW-OFF".
2. Mount on single electric switch box.

C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for four separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Programming based on every day of week.
7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
8. Battery replacement without program loss.
9. Thermostat display features include the following:
   a. Time of day.
   b. Actual room temperature.
   c. Programmed temperature.
   d. Programmed time.
   e. Duration of timed override.
   f. Day of week.
   g. System mode indications include "heating," "off," "fan auto," and "fan on."

D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

F. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

G. Fire-Protection Thermostats: Listed and labeled by an NRTL acceptable to authorities having jurisdiction; with fixed or adjustable settings to operate at not less than 75 deg F above normal maximum operating temperature, and the following:

1. Reset: Manual.
2. Reset: Automatic, with control circuit arranged to require manual reset at central control panel; with pilot light and reset switch on panel labeled to indicate operation.

3. Factory Calibration: 2.5 psig/deg F.
4. Range: 45 to 85 deg F.
5. Sensitivity Adjustment Range: 1 to 4 psig/deg F.
6. Dual-Temperature Thermostats: Automatic changeover from normal setting to lower setting for unoccupied cycles, with manual-reset lever to permit return to normal temperatures during unoccupied cycles, with automatic reset to normal during next cycle of operation.
7. Limits: Field adjustable, to limit setting cooling set point below 75 deg F, and heating set point above 75 deg F.
8. Room Thermostat Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
   d. Color: Selected by the Architect.
   e. Orientation: Vertical.
9. Room thermostat accessories include the following:
   a. Insulating Bases: For thermostats located on exterior walls.
   b. Thermostat Guards: Locking; heavy-duty, transparent plastic; mounted on separate base.
   c. Adjusting Key: As required for calibration and cover screws.
   d. Aspirating Boxes: For flush-mounted aspirating thermostats.
   e. Set-Point Adjustment: 1/2-inch- diameter, adjustment knob.

H. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

I. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

J. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

K. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

L. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.10 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Motors."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:
   a. Belimo Aircontrols (USA), Inc.
2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Dampers: Size for running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft.) of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.

f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: 40 to 104 deg F.
11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
12. Run Time: 12 seconds open, 5 seconds closed.

2.11 DAMPERS

A. Manufacturers:

1. Air Balance Inc.
2. Don Park Inc.; Autodamp Div.
3. Louvers and Dampers
4. Ruskin
5. United Enertech Corp.
6. Vent Products Company, Inc.

B. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.12 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 26 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

B. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.02 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install guards on thermostats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

E. Install automatic dampers according to Division 23 Section "Duct Accessories."

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components according to Division 23 Section "Mechanical Identification."

H. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

I. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

J. Install electronic and fiber-optic cables according to Division 26 Section "Voice and Data Communication Cabling."

3.03 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes."

B. Install building wire and cable according to Division 26 Section "Conductors and Cables."

C. Install signal and communication cable according to Division 26 Section "Voice and Data Communication Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.

8. Check DDC system as follows:
   a. Verify that DDC controller power supply is from emergency power supply, if applicable.
   b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
   c. Verify that spare I/O capacity has been provided.
   d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.05 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:
   a. Check analog inputs at 0, 50, and 100 percent of span.
   b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
   c. Check digital inputs using jumper wire.
   d. Check digital outputs using ohmmeter to test for contact making or breaking.
   e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
5. Flow:
   a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
   b. Manually operate flow switches to verify that they make or break contact.
6. Pressure:
   a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
   b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
7. Temperature:
   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
   b. Calibrate temperature switches to make or break contacts.
8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 23 23 00 REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.03 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air Conditioning Applications: 300 psig.
2. Suction Lines for Heat Pump Applications: 535 psig.
3. Hot Gas and Liquid Lines: 535 psig.

1.04 SUBMITTALS

A. Product Data shall be submitted for each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure regulating valves.

B. Contractor Installation Drawings (Shop Drawings) shall 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. Shop Drawing Scale: 1/4 inch equals 1 foot.
2. 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. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

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.

1.07 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L.

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 misalignment in minimum 7-inch- long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 degrees F.

2.02 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.

7. Maximum Operating Temperature: 275 degrees F.

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.
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.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 degrees F.

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.

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 conduit adapter, and 115-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 degrees F.
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: 400 psig.
6. Maximum Operating Temperature: 240 degrees F.

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 degrees F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

G. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: Internal.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240 degrees F.

H. 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.
5. Maximum Operating Temperature: 275 degrees F.

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.
7. Maximum Operating Temperature: 240 degrees F.

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 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow for heat-pump applications.
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 degrees F.

K. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 degrees F.

L. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 degrees F.

M. 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.
4. Maximum Operating Temperature: 275 degrees F.

2.03 REFRIGERANTS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 1-1/2 and Smaller: Copper, Type ACR or L, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Safety-Relief-Valve Discharge Piping:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
2. NPS 1-1/2 and Smaller: Copper, Type ACR or L, drawn-temper tubing and wrought-copper fittings with brazed joints.

3.02 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and 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 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 and hot-gas bypass 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. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.03 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 rigid or flexible conduit in locations where exposed to mechanical injury.

N. 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.

O. 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.

P. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.

3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Seal pipe penetrations through exterior walls according to Division 7 Section "Joint Sealants" for materials and methods.

S. Identify refrigerant piping and valves according to Division 23 Section "Mechanical Identification."

3.04 PIPE JOINT CONSTRUCTION

A. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. 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.

E. Threaded Joints: Thread steel 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.

F. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

3.05 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section 23 0529 "Hangers and Supports."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal run 20 feet or longer.
3. Spring hangers to support vertical runs.
4. 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: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.06 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, specialties, and receivers. 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.
   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.

3.07 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. 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.
4. Charge system with a new replaceable filter-dryer core in charging line.

3.08 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. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 31 13 DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section 23 0593 "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.03 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.04 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.
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, seismic restraints 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.

1.05 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."

PART 2 - PRODUCTS

2.01 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."

2.02 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 but not limited to the following:
   a. Lindab Inc.
   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."

1. Transverse Joints in Ducts Larger Than 60 Inches 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 in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches 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."

2.03 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: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. 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.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

E. 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.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.04 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. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:
   a. CertainTeed Corporation; Insulation Group.
   b. Johns Manville.
   c. Knauf Insulation.
   d. Owens Corning.
2. Maximum Thermal Conductivity:
   a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
   b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F 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 but not limited to 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).

C. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:
   a. Bonded Logic, Inc.
   b. Reflectix Inc.
2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature when tested according to ASTM C 518.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
4. 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).

D. 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-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

E. 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.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches 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. Fabricate edge facings at the following locations:
   a. Fan discharges.
   b. Intervals of lined duct preceding unlined duct.
   c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
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.
   a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
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.

2.05 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:

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.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
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, 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. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. 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).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. 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).

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.06 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, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. 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.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. 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.

2.07 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: 0.052-inch- thick, galvanized sheet steel with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene mechanically locked.

I. Blade Axles:

1. Material: Stainless steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

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 minimum.
   b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.08 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:
   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. Flexmaster U.S.A., Inc.
   d. McGill AirFlow LLC.
   e. METALAIRE, Inc.
   f. Nailor Industries Inc.
   g. Pottorff; a division of PCI Industries, Inc.
   h. Ruskin Company.
   i. Trox USA Inc.
   j. Vent Products Company, Inc.
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
   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 thick.

6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg 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.

B. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:
   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. Flexmaster U.S.A., Inc.
   d. McGill AirFlow LLC.
   e. METALAIRE, Inc.
   f. Nailor Industries Inc.
   g. Pottorff; a division of PCI Industries, Inc.
   h. Ruskin Company.
   i. Trox USA Inc.
   j. Vent Products Company, Inc.
2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Hat shaped.
   b. Galvanized-steel channels, 0.064 inch thick.
   c. Mitered and welded corners.
   d. 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, roll-formed steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered aluminum.
10. Tie Bars and Brackets: Galvanized steel
11. Accessories:
    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.09 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. Lloyd Industries, Inc.
8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
9. McGill AirFlow LLC.
10. METALAIRE, Inc.
11. Metal Form Manufacturing, Inc.
12. Nailor Industries Inc.
13. NCA Manufacturing, Inc.
14. Ruskin Company.
15. Vent Products Company, Inc.
16. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blades with maximum blade width of 8 inches.
2. Opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch- 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.

F. Bearings:

1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg 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.

2.10 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. PHL, Inc.
10. Pottorff; a division of PCI Industries, Inc.
11. Prefco; Perfect Air Control, Inc.
12. Ruskin Company.
13. Vent Products Company, Inc.
14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

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 static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream or Multiple-blade type; fabricated with roll-formed, 0.034-inch- 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 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- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated fusible links.

K. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F and 212 deg F rated.

2.11 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to 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.

2.12 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

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.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. 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."

E. Vane Construction: Double wall.

2.13 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed, 3/4 inches deep.

F. Wall-Box Cover-Plate Material: Stainless steel.

2.14 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

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. Vision panel.
   d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   e. 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 Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside handles].
   d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 10-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.

8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.15 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to 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 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.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.16 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

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 wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- 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.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz. /sq. yd.
2. Minimum Tensile Strength: 500 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz. /sq. yd.
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz. /sq. yd.
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.17 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of but not limited to the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

C. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

D. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

E. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.

2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.18 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 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

3.01 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.

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, 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.

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."

3.02 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.

3.03 DUCT SEALING

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 and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: 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 and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.

11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.04 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 thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches 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, "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 of each elbow and within 48 inches 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 intervals of 16 feet.

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.

3.05 CONNECTIONS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 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.

3.07 ACCESSORIES 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 and/or control 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 and smoke dampers according to UL listing.

H. Install duct security bars. Construct duct security bars from 0.164-inch steel sleeve, continuously welded at all joints and 1/2-inch- diameter steel bars, 6 inches o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch hinged access panel with cam lock in duct in each side of sleeve.

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 and downstream 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 doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream and downstream 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.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Division 15 Section "Identification for 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 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 lengths of flexible duct. Do not use flexible ducts to change directions.

P. Connect diffusers or light troffer boots to ducts directly or with maximum 84-inch lengths of flexible duct clamped or strapped in place.

Q. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

R. Install duct test holes where required for testing and balancing purposes.

S. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.08 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, smoke, and combination 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.
5. Operate remote damper operators to verify full range of movement of operator and damper.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
   a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
   a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.09 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

END OF SECTION

SECTION 23 34 00 CENTRIFUGAL FANS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Backward-inclined centrifugal fans.
   2. Forward-curved centrifugal fans.

1.03 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   1. Wiring Diagrams: Power, signal, and control wiring.
   2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.04 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.06 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.01 BACKWARD-INCLINED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB Fan Group North America.
2. Acme Engineering & Mfg. Corp.
3. Aerovent; a Twin City Fan Company.
4. Ammerman; General Resource Corp.
5. Central Blower Company.
6. Chicago Blower Corporation.
7. Cincinnati Fan.
8. Industrial Air; a division of Lau Industries, Inc.
9. Loren Cook Company.
10. New York Blower Company (The).

B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

C. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Horizontally split, bolted-flange housing.
3. Spun inlet cone with flange.
4. Outlet flange.

D. Backward-Inclined Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

G. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

H. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

I. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor Size: 1.5.
2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
3. Motor Pulleys: Adjustable pitch for use with motors through 5hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
6. Motor Mount: Adjustable for belt tensioning.

J. Accessories:

1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
2. Cleanout Door: Quick-opening, latch-type gasketed door allowing access to fan scroll, of same material as housing.
3. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.
4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
5. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
6. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
7. Inlet Screens: Grid screen of same material as housing.
8. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
9. Spark-Resistant Construction: AMCA 99.
10. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
11. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

K. Motors: Comply with requirements in Division 15 Section "Motors."

1. Enclosure Type: Totally enclosed, fan cooled.

2.02 FORWARD-CURVED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB Fan Group North America.
2. Acme Engineering & Mfg. Corp.
3. Aerovent; a Twin City Fan Company.
4. Airmaster Fan Co.
5. Ammerman; General Resource Corp.
6. Central Blower Corporation.
7. Chicago Blower Corporation.
8. Industrial Air; a division of Lau Industries, Inc.
9. Loren Cook Company.
10. New York Blower Company (The).

B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

C. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Horizontally split, bolted-flange housing.
3. Spun inlet cone with flange.
4. Outlet flange.

D. Forward-Curved Wheels: Black-enameled or galvanized steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

G. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

H. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 120,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 120,000 hours.

I. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor Size: 1.5.
2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
3. Motor Pulleys: Adjustable pitch for use with motors through 5hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
6. Motor Mount: Adjustable for belt tensioning.

J. Accessories:

1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
2. Cleanout Door: Quick-opening, latch-type gasketed door allowing access to fan scroll, of same material as housing.
3. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.
4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
5. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
6. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
7. Inlet Screens: Grid screen of same material as housing.
8. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
9. Spark-Resistant Construction: AMCA 99.
10. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
11. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.03 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Support floor-mounting units using spring isolators or restrained spring isolators having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D. Install floor-mounting units on concrete bases designed to withstand, without damage to equipment, the seismic force required by authorities having jurisdiction. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

E. Support suspended units from structure using threaded steel rods and elastomeric hangers; spring hangers or spring hangers with vertical-limit stops having a static deflection of 1 inch. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

F. Install units with clearances for service and maintenance.

G. Label fans according to requirements specified in Division 15 Section "Mechanical Identification."

3.02 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 fans to allow service and maintenance.

C. Install line-sized piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain.

D. Ground equipment according to Division 16 Section "Grounding and Bonding."

E. Connect wiring according to Division 16 Section "Conductors and Cables."

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

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, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
10. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

SECTION 23 36 00 TERMINAL UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Fan-powered terminal units.
2. Shutoff, single-duct terminal units.

1.03 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For terminal units. 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.
3. Hangers and supports, including methods for duct and building attachment**,** and vibration isolation.

C. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
2. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Above ceiling items such as structure, piping, ductwork, and conduit / cable tray system.

D. Field quality-control reports.

E. Operation and Maintenance Data: For terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.04 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

1.05 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. Fan-Powered-Unit Filters: Furnish one spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.01 PARALLEL FAN-POWERED TERMINAL UNITS

A. Subject to compliance with requirements, provide products by one of the following:

1. Carnes.
2. Environmental Technologies, Inc.
3. METALE, Inc.
4. Price Industries.
5. Titus.
6. Trane; a business of American Standard Companies.

B. Configuration: Volume-damper assembly and fan in parallel arrangement inside unit casing with control components inside a protective metal shroud.

C. Casing: 22 gauge steel, single wall.

1. Casing Lining: Adhesive attached, 1-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
   a. Cover liner with nonporous foil.
2. Inlets: Round stub connections or S-slip and drive connections for duct attachment.
3. Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with tight gasket and quarter-turn latches.
5. Fan: Forward-curved centrifugal, located at plenum air inlet.

6. Airstream Surfaces: Surfaces in contact with the stream shall comply with requirements in ASHRAE 62.1.

D. Volume Damper: Galvanized steel with flow-sensing ring and peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal flow at 3-inch wg inlet static pressure.
2. Damper Position: Normally closed.

E. Velocity Sensors: Multipoint array with velocity sensors in cold- and hot-deck air inlets and outlets.

F. Motor:

1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.
2. Type: Permanent-split capacitor with SCR for speed adjustment.
3. Fan-Motor Assembly Isolation: Rubber isolators.
4. Enclosure: Open dripproof.
5. Enclosure Materials: Cast iron.
6. Efficiency: Premium efficient.
7. Motor Speed: Multispeed.
   a. Speed Control: Infinitely adjustable with pneumatic-electric and electronic controls.

G. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Material: Polyurethane foam having 70 percent arrestance and 3 MERV.
2. Material: Glass fiber treated with adhesive; having 80 percent arrestance and 5 MERV.
3. Material: Pleated cotton-polyester media having 90 percent arrestance and 7 MERV.
4. Thickness: 1 inch.

H. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Location: Plenum air inlet.
2. Stage(s): 2 (minimum).
3. Access door interlocked disconnect switch.
4. Downstream air temperature sensor with local connection to override discharge-temperature to not exceed a maximum temperature set point (adjustable.)
5. Nickel chrome 80/20 heating elements.
6. Air flow switch for proof of flow.
7. Fan air interlock contacts.
8. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
9. Mercury contactors.
10. Pneumatic-electric switches and relays.
11. Magnetic contactor for each step of control (for three-phase coils).

I. Factory-Mounted and -Wired Controls: Electrical components mounted in control box with removable cover. Incorporate single-point electrical connection to power source.

1. Control Transformer: Factory mounted for control voltage on electric and electronic control units with terminal strip in control box for field wiring of thermostat and power source.
2. Wiring Terminations: Fan and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box that is sized according to NFPA 70.
3. Disconnect Switch: Factory-mounted, fuse type.

J. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from flow and mounted on side of unit.

K. Electric Controls: 24-V damper actuator with wall-mounted electric thermostat and appropriate mounting hardware.

L. Electronic Controls: Bidirectional damper operator and microprocessor-based controller with integral flow transducer and room sensor. Control devices shall be compatible with temperature controls specified in Division 15 Section "HVAC Instrumentation and Controls" and shall have the following features:

1. Occupied and unoccupied operating mode.
2. Remote reset of flow or temperature set points.
3. Adjusting and monitoring with portable terminal.
4. Communication with temperature-control system specified in Division 15 Section "HVAC Instrumentation and Controls."

2.02 SHUTOFF, SINGLE-DUCT TERMINAL UNITS

A. Subject to compliance with requirements, provide products by one of the following:

1. Carnes.
2. Environmental Technologies, Inc.
3. Krueger.
4. METALE, Inc.
5. Price Industries.
6. Titus.
7. Trane; a business of American Standard Companies.
8. Tuttle & Bailey.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 22 gauge steel, single wall.

1. Casing Lining: Adhesive attached, 1-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
   a. Cover liner with nonporous foil.
2. Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Outlet: S-slip and drive connections, size matching inlet size.

4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with tight gasket.
5. stream Surfaces: Surfaces in contact with the stream shall comply with requirements in ASHRAE 62.1-2004.

D. Regulator Assembly: System--powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140°F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal flow at 3-inch wg inlet static pressure.
2. Damper Position: Normally closed.

F. Attenuator Section: 22 gauge (minimum) steel sheet.

1. Lining: Adhesive attached, 1-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
   a. Cover liner with nonporous foil.
2. stream Surfaces: Surfaces in contact with the stream shall comply with requirements in ASHRAE 62.1-2004.

G. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Thermostat: Wall-mounted electronic type with clock display, temperature display in Fahrenheit and Celsius, and space temperature set point.

H. Electronic Controls: Bidirectional damper operator and microprocessor-based thermostat with integral flow transducer and room sensor. Control devices shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant flow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
3. Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.

I. Direct Digital Controls: Single-package unitary controller and actuator specified in Division 15 Section "HVAC Instrumentation and Controls."

J. Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Division 15 Section "HVAC Instrumentation and Controls" and shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Terminal Unit Controller: Pressure-independent, variable--volume controller with electronic flow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum volumes, and having the following features:
   a. Occupied and unoccupied operating mode.
   b. Remote reset of flow or temperature set points.
   c. Adjusting and monitoring with portable terminal.
   d. Communication with temperature-control system specified in Division 15 Section "HVAC Instrumentation and Controls."
3. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

2.03 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments shall be cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments shall be electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: Galvanized steel complying with ASTM A 603.

D. 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.

E. Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.04 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled terminal units according to ARI 880.

   1. Label each terminal unit with plan tag number, nominal flow, maximum and minimum factory-set flows, coil type and ARI certification seal.

B. Factory Tests: Test assembled terminal units with hydronic heating coils according to ARI 880 plus coils shall be leak tested under water for 300 psi and shall be suitable for a minimum working pressure of 200 psig and a maximum entering-water temperature of 250°F.

   1. Label each terminal unit with plan tag number, nominal flow, maximum and minimum factory-set flows, coil type, coil gpm and ARI certification seal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install each type terminal unit level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.02 HANGER AND SUPPORT INSTALLATION

A. Building Attachments: Concrete inserts, Structural Engineer approved 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 Structural Engineer approved powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4” thick.
4. Do not use powder-actuated concrete fasteners for seismic restraints.

B. Hangers Exposed to View: Threaded rod and angle or channel supports.

C. 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.

3.03 IDENTIFICATION

A. Label each terminal unit with plan number, nominal flow, water flow gpm (if applicable) and maximum / minimum factory-set flows. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform tests and inspections of components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. After installing terminal units and after electrical circuitry has been energized, test for compliance with requirements.
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. Terminal unit will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.05 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

END OF SECTION

SECTION 23 37 13 DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
1. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.
4. Adjustable bar registers and grilles.
5. Fixed face registers and grilles.

B. Related Sections:

1. Division 23 Section 23 3113 "Ductwork and Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.03 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 Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.01 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek company.
   b. Carnes.
   c. Hart & Cooley Inc.
   d. Krueger.
   e. METALAIRE, Inc.
   f. Nailor Industries Inc.
   g. Price Industries.
   h. Titus.
   i. Tuttle & Bailey.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Anodized aluminum color selected by Architect.
5. Face Size: 24 by 24 inches.
6. Face Style: four cones.
7. Mounting: Surface, T-bar, Snap in or Spline.
8. Pattern: Adjustable.
9. Dampers: Radial opposed blade.
10. Accessories:
    a. Equalizing grid.
    b. Plaster ring.
    c. Safety chain.
    d. Wire guard.
    e. Sectorizing baffles.
    f. Operating rod extension.

B. Perforated Diffuser :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Air Research Diffuser Products, Inc.
   b. Anemostat Products; a Mestek company.
   c. Carnes.
   d. Hart & Cooley Inc.
   e. Krueger.
   f. METALAIRE, Inc.
   g. Nailor Industries Inc.
   h. Price Industries.
   i. Titus.
   j. Tuttle & Bailey.
   k. Warren Technology.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel backpan and pattern controllers, with aluminum face.
4. Finish: Anodized aluminum color selected by Architect.
5. Face Size: 24 by 24 inches.
6. Duct Inlet: Round or Square.
7. Face Style: Flush.
8. Mounting: Surface, T-bar, Snap in or Spline.
9. Pattern Controller: Adjustable with louvered pattern modules at inlet.

10. Dampers: Opposed blade.
11. Accessories:
    a. Equalizing grid.
    b. Plaster ring.
    c. Safety chain.
    d. Wire guard.
    e. Sectorizing baffles.
    f. Operating rod extension.

C. Louver Face Diffuser :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.
    e. Price Industries.
    f. Titus.
    g. Tuttle & Bailey.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel backpan and pattern controllers, with aluminum face.
4. Finish: Anodized aluminum color selected by Architect.
5. Face Size: 24 by 24 inches.
6. Duct Inlet: Round or Square.
7. Face Style: Flush.
8. Mounting: Surface, T-bar, Snap in or Spline.
9. Pattern Controller: Adjustable with louvered pattern modules at inlet.
10. Dampers: Opposed blade.
11. Accessories:
    a. Square to round neck adaptor.
    b. Adjustable pattern vanes.
    c. Throw reducing vanes.
    d. Equalizing grid.
    e. Plaster ring.
    f. Safety chain.
    g. Wire guard.
    h. Sectorizing baffles.
    i. Operating rod extension.

2.02 REGISTERS AND GRILLES

A. Adjustable Bar Grille :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. Dayus Register & Grille Inc.
    d. Hart & Cooley Inc.
    e. Krueger.
    f. METALAIRE, Inc.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 1/2 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Vertical spaced 1/2 inch apart.
7. Frame: 1 inch wide.
8. Mounting: Countersunk screw.

B. Fixed Face Register / Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek company.
   b. Carnes.
   c. Dayus Register & Grille Inc.
   d. Hart & Cooley Inc.
   e. Krueger.
   f. Nailor Industries Inc.
   g. Price Industries.
   h. Titus.
   i. Tuttle & Bailey.
2. Material: Steel.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: Perforated core.
5. Core Construction: Integral.
6. Frame: 1 inch wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.
9. Accessory: Filter.

2.03 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

3.01 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 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.

3.03 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 82 16 SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.03 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.05 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.06 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.

1. Warranty Period: Five years from date of Substantial Completion.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Friedrich Air Conditioning Company.
3. Lennox Industries Inc.
4. Mitsubishi Heavy Industries America, Inc.; Air-Conditioning & Refrigeration Division, Inc.
5. Sanyo Fisher (U.S.A.) Corp.
6. Trane Company (The); Unitary Products Group.

2.02 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2004.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

E. Fan Motors: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Disposable Filters: 1 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 6 or higher.

G. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Direct drive, centrifugal fan.

E. Fan Motors: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Filters: Permanent, cleanable, with ASHRAE 52.2 MERV rating of 6 or higher.

2.04 CEILING-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Direct drive, centrifugal fan and integral condensate pump.

E. Fan Motors: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Filters: Permanent, cleanable, with ASHRAE 52.2 MERV rating of 6 or higher.

2.05 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, 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.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating or Scroll.
2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant: R-407C or R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Fan: Aluminum-propeller type, directly connected to motor.

E. Motor: Permanently lubricated, with integral thermal-overload protection.

F. Low Ambient Kit: Permits operation down to 45°F.

G. Mounting Base: Polyethylene.

H. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.06 ACCESSORIES

A. Thermostat: Low voltage with subbase to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection, including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. 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.

1. Minimum Insulation Thickness: ¾" thick.

PART 3 - EXECUTION

3.01 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 compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Duct Connections: Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors.

C. Ground equipment according to Division 26 Section "Grounding and Bonding."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

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.

B. Remove and replace malfunctioning units and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 23 82 39 UNIT HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.03 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.04 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Details of anchorages and attachments to structure and to supported equipment.
4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
5. Location and arrangement of piping valves and specialties.
6. Location and arrangement of integral controls.
7. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which unit heaters will be attached.
3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

6. Perimeter moldings for exposed or partially exposed cabinets.

1.05 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 Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.01 WALL AND CEILING HEATERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Berko Electric Heating; a division of Marley Engineered Products.
2. Chromalox, Inc.; a division of Emerson Electric Company.
3. Indeeco.
4. Markel Products; a division of TPI Corporation.
5. Marley Electric Heating; a division of Marley Engineered Products.
6. QMark Electric Heating; a division of Marley Engineered Products.
7. Trane.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:

1. Front Panel: Stamped-steel louver or Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

F. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated**,** multispeed.

G. Controls: Unit-mounted thermostat.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof

B. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.03 CONNECTIONS

A. Comply with safety requirements in UL 1995.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect**,** field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 23 83 10 ELECTRIC INFRARED RADIANT HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes electric, infrared and high-intensity infrared radiant heaters.

1.03 SUBMITTALS

A. Product Data: For each type of electric radiant heater indicated. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings shall 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 shall include power**,** signal, and control wiring.

C. Coordination Drawings for Contractor installation shall include plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which equipment will be attached.

D. Field quality-control test reports.

E. Operation and Maintenance Data for electric radiant heaters to include in emergency, operation, and maintenance manuals.

1.04 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.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric radiant heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 HIGH-INTENSITY INFRARED HEATERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Combustion Research Corporation.
2. Electric Products Inc.; Space-Ray Div.
3. Panelbloc, Inc.
4. Reznor/Thomas & Betts Corporation.
5. Roberts-Gordon, Inc.
6. Sterling HVAC Products; Div. of Mestek Technology Inc.

B. Reflector: Polished aluminum.

C. Accessories:

1. Parabolic reflector.
2. Wire grid for increased efficiency.
3. Protective screen.
4. Heat-deflector shield.
5. Stainless-steel flexible connector with manual valve.
6. Hanger chain with "S" hooks.
7. Preassembled chain suspension kit.

2.02 CONTROLS

A. Thermostat: 2-stage, wall-mounting type with 50°F to 90°F operating range and fan on switch.

1. Control Transformer: Integrally mounted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install and connect electric radiant heaters according to manufacturer's written installation instructions.

B. Suspended Units: Suspend from substrate using chain hanger kits and building attachments.

C. Maintain manufacturers' recommended clearances to combustibles.

3.02 CONNECTIONS

A. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify bearing lubrication.
3. Verify proper motor rotation.
4. Test Reports: Prepare a written report to record the following:
   a. Test procedures used.
   b. Test results that comply with requirements.
   c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

B. Remove and replace malfunctioning units and retest as specified above.

3.04 ADJUSTING

A. Adjust initial temperature set points.

B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.05 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain electric radiant heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 26 05 00 GENERAL PROVISIONS

PART 1 - GENERAL

1.01 GOVERNING CLAUSE

A. For the sake of brevity these specifications shall omit phrases such as AContractor shall furnish and install@, Aunless otherwise indicated or specified@, etc., but these phrases are nevertheless implied. Mention of materials and operations requires the Contractor to furnish and install such materials and perform such operations to provide a complete and operating system to the satisfaction of the Architect.

1.02 GENERAL CONDITIONS

A. General Conditions, Supplementary General Conditions, Information to Bidders, General Requirements and Alternates and other pertinent documents issued by the Architect are a part of these specifications and shall be complied with in every respect.

B. Notwithstanding any reference in the specifications to any article, device, product, materials, fixture, form, or type of construction by name, make, or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgement of the Architect, expressed in writing, is equal to that specified.

C. This project requires major renovation of existing systems along with additions and modifications. All existing areas and equipment not under modification shall remain in operation. Electrical service shall not be interrupted except with approval of the Architect and interruption shall occur at the convenience of the Owner with proper advance notification. This may require week-end and night work.

D. Where new work or demolition affects existing electrical equipment and/or circuitry which will remain, the equipment shall be removed, relocated as required, and recircuited in accord with these specifications. Any necessary temporary relocation, as determined by the Architect, shall be done at no extra cost and in a safe and secure manner.

E. Demolition of existing equipment noted or required by the new work shall consist of removal of equipment, removal of exposed conduit, removal of wiring back to next in line junction or over-current protection and re-connection and/or rerouting of feed-thru circuits. All equipment removed shall remain the property of the Owner unless the Contractor is otherwise instructed in which case it shall be removed from the site by the Contractor.

F. Prior to beginning work, Contractor shall note (in writing to the Architect) any deficiencies in the existing systems that are to be modified by this project. This shall be used to determine the final operating condition of systems at the completion of this project.

G. Where existing panels/switchboards are shown or noted to be used for new circuits, existing adequate breakers and spaces may be used for the new circuits. Where space is inadequate, Contractor shall furnish new panel/enclosure with sufficient pole capacity and serve by tapping bus of existing panel.

1.03 RECORD DRAWINGS

A. The contractor shall provide the Architect at job acceptance the following:

1. Two (2) sets of blue line prints of same scale as original drawings marked in red showing all variations of the work actually installed related to the original drawings. This set of drawings shall include all, addenda, approved and installed change orders, field condition changes, and other departures from the original plans and specifications.
2. Three (3) sets of shop drawings and other data required by the specifications reflecting the manufacturer's shop fabrication of the materials actually installed. The Division 16 shop drawings shall be separately post bound, indexed, and tabbed by specification section. Faxed or copies of faxed material shall not be used in Close-Out Documents.
3. Operation and maintenance manuals and manufacturer=s instructions.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND OBSERVATIONS

A. The complete job shall be, during and/or after construction, subject to the tests and observations as herein described and as noted on the drawings. Deficiencies found as a result of these tests and observations shall be corrected by the Contractor within a reasonable period and at no expense to the Owner.

B. By Architect's observations and tests conducted by him or for him in his presence. Upon notice, Contractor shall furnish not to exceed two men, one to include the job foreman, and tools to assist and be directed by the Architect for a reasonable amount of time to make such tests and observations as are requested by the Architect.

C. Conductor insulation tests shall be performed in the Architect's presence and shall be subject to his approval. A written report of these tests shall be submitted to the Architect for approval prior to acceptance of the work.

600-Volt Conductor: Using a 500-volt megger, each circuit conductor shall be tested with all splices made but no equipment connected. The ohmic value shall be recorded and results must meet minimum requirements as follows:

Wire Size	Kilohms
#12	1000
#10-#8	250
#6-#3	100
#2-#3/0	50
#4/0-500 MCM	25
750 MCM	12

1. Feeders with paralleled conductors shall have conductors tested separately prior to paralleling.
2. Conductors not meeting these minimum values shall be repaired or replaced as directed by the Architect.

D. By any Federal, State and/or local authority.

E. By the Owner's Insurance Carrier. After inspection by this agency, Contractor shall make corrections of any deficiencies found adversely affecting the insurance to be carried by the Owner. Acceptance of the Owner's Insurance Carrier's report or subsequent reports lie with the Architect or Owner.

F. Special Systems Test: The systems covered by Sections 16600 ASpecial Systems@ shall be tested for proper operation after complete installation in accord with the manufacturer=s recommendations, applicable codes and test guidelines as detailed in the appropriate system=s specifications. The testing shall be done by an independent, third-party company qualified to test the system involved. Testing company qualifications shall be submitted to the Architect and must be approved by the Architect before testing begins.

A full report of test results as outlined in the associated system is specifications shall be submitted to the Architect in writing prior to substantial completion. Where system(s) operations involve other Divisions of the Specifications, the affected Professional shall verify by signed statement that the operation was correct and complete. Retesting as necessary to achieve a completed report(s) shall be required. The Architect will perform random component testing at substantial completion. Should the system(s) not perform correctly, a complete re-test can be required with no increase in cost to the Owner. If more than one re-check by the Architect is required to verify proper system(s) operation, the Contractor will be billed for the time and expense of the Architect.

3.02 GUARANTEE

A. Guarantee to the Owner all work performed under this contract to be free from defects in workmanship and materials for a period of one year from date of final acceptance by the Architect and the Owner except as hereinafter noted.

1. Remedy within a reasonable period any defects arising during this period at his own expense upon notice of the Owner or his authorized representative.

2. Lamps are hereby exempt from a one-year guarantee as follows:

a. All lamps are to be operating upon acceptance of the job.
b. All incandescent lamp burn-outs occurring during the first thirty (30) days after final acceptance shall be reported to the Architect at the end of this thirty-day period. Replacements for these burn-outs shall be furnished and installed by the Contractor upon notice from the Architect.
c. All gaseous vapor discharge lamp burn-outs occurring during the first one-hundred eighty (180) days after final acceptance shall be reported to the Architect at the end of this one hundred eighty-day period. Replacements for these burn-outs shall be furnished and installed by the Contractor upon notice from the Architect.

END OF SECTION

SECTION 26 05 01 CODES AND STANDARDS

PART 1 - GENERAL

1.01 CODES

A. Strictly comply with the latest edition of the National Electrical Code (NEC), National Fire Protection Association (NFPA), International Building Code (IBC), National Electrical Safety Code (ANSI-C2) and all Federal, State and/or local codes. Notify Architect of any conflict between these codes and the drawings and/or specifications before bid date or correct conflicts at his own expense.

1.02 STANDARDS

A. Familiarize himself, coordinate, and cooperate with all other trades in installation of his materials. Layout of Division 16 work shall be the responsibility of this Contractor and all conflicts with Division 16 work and other trades shall be resolved prior to installation.

B. Use only new equipment/materials of current manufacturer which are listed by Underwriters' Laboratories when such listings are issued for the type of equipment/materials, approved by NEMA standards, National Electrical Code standards or other appropriate agency. Equipment/material shall be of current production from manufacturer=s of long experience in the manufacturer of such type equipment/material and who are regularly engaged in the production of this type equipment/material.

C. Equipment/materials shall have local service representation where applicable.

D. Notify Architect prior to installation of conflicts between electrical and structural, architectural, mechanical, etc. work.

E. Equipment/materials installed and connected in strict compliance with manufacturer's recommendations unless these requirements are exceeded as noted on the drawings or specified herein.

F. Equipment/materials shall be installed and connected in a neat and workmanlike manner.

G. Use experienced labor or employ appropriate Sub-Contractor to do all cutting and patching necessary for installation of his materials. Obtain permission from Architect and General Contractor before cutting any structural member.

H. Not to scale electrical drawings. Follow architectural, equipment supplier shop drawings, and manufacturers shop and installation drawings for accuracy.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 26 05 02 ELECTRICAL SYSTEMS SCHEDULE

PART 1 - GENERAL

1.01 Systems

A. All electrical materials and operations for complete and operative systems as follows:

Secondary electrical distribution system

Power outlets and connections to all motors and equipment.

Isolated power system.

Lighting system complete with controls and fixtures.

Telephone outlets and conduits.

Data outlets and conduits.

Electronic security/access control system

Video Surveillance system.

Miscellaneous as shown on the drawings and as stated herein.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 26 05 03 BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 General

A. Equipment is specified by manufacturer's name and catalog number and is intended to establish the minimum standards of quality acceptable.

B. Substitute equipment, equivalent in all respects to that specified, is permitted with the written approval of the Architect. Approval will not be considered until after award of contract and only if submitted by the Contractor.

C. The manufacturers name first mentioned in this specification is considered to be the specified equipment. The "or equal" manufacturers mentioned or other manufacturers proposed by the Contractor shall be considered as substituted equipment.

D. Substituted equipment shall meet the dimensional and functional requirements of the building as represented by the plans and specifications. All revisions to the contract precipitated by the use of substituted equipment shall be incorporated by the Contractor, after approval in writing by the Architect, at no additional cost to the Owner.

E. Architect's approval of shop drawings does not relieve the Contractor from satisfying the requirements of the drawings and specifications. Any equipment or work found in the judgement of the Architect to be defective or otherwise unsuitable shall be repaired or replaced by the Contractor at no additional cost to the Owner.

F. If requested in writing by the Architect, the Contractor shall submit a scale drawing (scale as directed by Architect) of any electrical equipment area, conduit layout, or the like which in the opinion of the Architect may present difficulty regarding space allocation or clearances.

G. Mounting Heights

1. Mounting heights of various devices, outlets, safety switches, panelboards and the like shall reference the height above the finished floor or grade above which they are mounted. Heights specified shall reference the center of the device, box, breaker or switch operating handle.
2. Mounting heights may be adjusted slightly to permit cutting of masonry block to the top or bottom of the block course nearest the required height. All heights shall be consistently cut above or below block coursing so that they will be the same height above the reference.
3. Mounting heights shall be as follows:

Description	Mounting Height
Switch Toggle	Forty-eight inches to center
Receptacle	Sixteen inches to center
Safety Switch	Fifty-four inches to center
Panelboard	Seventy-eight inches to top breaker
Enclosed Circuit Breakers	Fifty-four inches to center
Receptacle or Switch above counter top	Four inches to center above counter / backsplash

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSTRUCTIONS

A. After notice to proceed and with promptness to assure reasonable time for review and no delay to the project, the Contractor shall submit to the Architect the following for approval whether or not substituted items:

1. Nine (9) copies of shop drawings, studies and submittals showing overall dimensions, bus sizes, bussing diagram, lug sizes, panel schedules, equipment ratings, metal preparation process, finishes and all other pertinent information for the following items. Shop drawings shall be post-bound, indexed per the appropriate specification sections and with all drawings readable without being removed or unstapled for all submittals.

   Panelboards

   Dry type transformers

   Conduit and other raceways

   Wire and cable

   Required cable test reports

   Wiring devices

   Lighting fixtures

   Lamps

   Security and access system components

   Video surveillance system components

2. All shop drawings including one-line diagrams shall be submitted together. Partial submittals will not be reviewed without prior consent.

END OF SECTION

SECTION 26 05 04 ELECTRICAL SERVICE SYSTEM

PART 1 - GENERAL

1.01 SECONDARY ELECTRICAL SERVICE

A. Shall be 480/277 volts, three phase, 4 wire, 60 HZ, wye connected.

B. Service entrance conduit shall have proper length of tail-wire protruding from approved service entrance fitting for connection to the service facilities.

C. Verify the service voltage and service entrance requirements with the Utility Company prior to any rough-in or material purchase and notify the Architect of any required changes. Failure to adhere to this requirement shall make this Contractor responsible for correction.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 SECONDARY ELECTRICAL SERVICE

A. The Division 16 Contractor shall allow in his bid price the sum of twelve thousand dollars to be paid to the Utility Company for portions of the permanent electrical service not normally furnished under their standard service policy. Any charge from the Utility Company under and/or above this amount respectively shall be refunded to the Owner and/or added by change order to the contract.

3.02 ELECTRICAL METERING

A. All electrical meters shall be furnished and installed by Utility Company.

B. Meter sockets and/or boxes shall be furnished and installed by the Utility Company. Location shall be as directed by the Utility Company and this Contractor shall fully coordinate all aspects which affect the service entrance conductors.

C. Current transformers shall be furnished and installed by the Utility Company.

D. All wiring from current transformers to meter shall be furnished and installed by the Utility Company.

END OF SECTION

SECTION 26 05 06 ELECTRICAL POWER CONNECTIONS

PART 1 - GENERAL

A. Grounding and bonding systems shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 – PRODUCTS
NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Shall be installed in conduit in accordance with SECTION 16110 "RACEWAYS AND FITTINGS".

B. Review architectural drawings and specifications and provide adequate service for and make proper connection to all equipment furnished by General Contractor requiring electrical service.

C. Carefully review plumbing and HVAC drawings and Division 15 of the specifications for mechanical equipment requiring electrical service. Provide adequate service for and make proper connection to all such mechanical equipment requiring electrical service.

D. Electrical connections to equipment shall follow the equipment manufacturer's recommended method. Where equipment furnished exceeds the circuit capacity or requires different characteristics than that shown on the drawings, this information shall be brought to the attention of the Architect, prior to rough-in, or this Contractor shall be responsible for correction.

E. The Division 16 Contractor shall immediately upon notice to proceed and after verification of service with Utility Company, notify in writing the General Contractor and all other affected Contractors the characteristics of the electrical service including voltage and phase. A copy of this notification shall be sent to the Architect.

F. All equipment connections to include a maintenance disconnect of the type indicated or, if not specifically indicated, as recommended by the equipment manufacturer in compliance with the NEC.

G. Where power connections are made out of doors from safety switches and where there is no wall or proper equipment frames to which the switches may be mounted, Contractor shall furnish and install a galvanized angle iron frame independent of the equipment for support of the switches. Frames shall consist of the steel frame sufficient to support all of the switches and a concrete footing not less than 12 inches deep and of sufficient width to assure that 6 inches of concrete surround all of the framing members.

H. On multi-motor equipment connections (i.e. condensing units, roof-top A/C units, etc.), Division 16 Contractor shall verify with Division 15 Contractor and obtain in writing the manufacturer's requirements for equipment overcurrent device. Where fuses or HACR breakers are permitted, furnish HACR rated breaker of size required by manufacturer of equipment. Where fuses only are permitted, furnish fusible disconnect with fuse size required by manufacturer of equipment. Obtain written approval of Division 15 Contractor of overcurrent size before energizing equipment.

3.02 INSTRUCTIONS

A. Connections by Division 16 Contractor to equipment furnished under Division 15 of the specifications and the mechanical drawings.

1. Manual motor switch control and final connections to all ventilating fans. Where fans are furnished with speed controls, the Division 16 Contractor shall mount the control where directed in addition to the manual motor switch. Where fans control or are controlled by other equipment such as timers, motorized louvers, firestats, EMCS control panels, etc., the Division 16 Contractor shall coordinate with the supplying Contractor and make connection to the fan through or with this device as required for proper operation.
2. Set disconnect switch near (within 5') or other approved device if disconnect switch not indicated, and make final connection to equipment as required in accordance with SECTION 16110, "RACEWAYS AND FITTINGS". Connections to include power wiring to line voltage control device such as magnetic starter, contactor, etc., and from load side of control device through motor terminals. The control devices shall be furnished by the Division 15 Contractor and installed, where directed, by the Division 16 Contractor. Control devices which are integral pre-wired parts of equipment require connection to line side of control device only by Division 16 Contractor unless otherwise indicated. All additional wiring including control wiring shall be furnished and installed by the Division 15 Contractor. Line voltage thermostats and other temperature control devices regardless of voltage shall be furnished, installed, wired and connected by the Division 15 Contractor.

B. Connections by Division 16 Contractor to equipment furnished under other Divisions of the specifications.

1. Set disconnect switch near (within 5') or other approved device, if disconnect switch not shown and make final connection to equipment as required in accord with SECTION 16110 "RACEWAYS AND FITTINGS". Connection to include power wiring to the line side of the equipment controller or to the power connection location as applicable.
2. Division 16 Contractor shall obtain approved rough-in drawing for each item of equipment requiring connection and follow manufacturer's recommendation as to location and method of connections. Additional requirements are as follows:

Shop equipment: Connection location to be taken from shop equipment drawings if available or architectural drawings. Equipment served from receptacle to have type "SO" neoprene cord connections of same size as branch circuit with green ground conductor grounded and properly bonded to equipment chassis.
Monorail Crane: Connection location and specific wiring requirements to be taken from shop drawings of unit purchased and connection shall include accessory items such as controls, valves, etc. as required by item purchased.

Overhead Doors: Connection to include power service to operator and installing remote control switches furnished with door. Verify all requirements with shop drawings of door furnished and provide all necessary connections and hardware.

END OF SECTION

SECTION 26 05 19 CONDUCTORS

PART 1 - GENERAL

1.01 GENERAL

A. Conductors shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.01 INSTRUCTIONS (600 VOLTS)

A. Conductors shall be standard annealed copper rated 600 volts with mechanical strength, insulation, temperature and carrying capacity adequate for the particular conditions under which they are used and in accordance with the following:

1. In wet or dry locations type "THWN" unless shown on drawings or specified herein to be other type.
2. In unwired fixtures where required by National Electrical Code, use approved heat-resistant wire sized for current, voltage and temperature at which fixture operates.
3. Branch circuit conductors within three inches of a ballast within the ballast compartment of fluorescent fixtures shall be recognized for use at temperatures not lower than ninety degrees celsius. Asbestos wire shall not be used for this application.
4. Conductors entering the self-contained ballast compartment of gaseous vapor discharge fixtures shall be rated 600 volts, silicone rubber, fixture wire, number ten AWG, stranded copper conductor, silicone rubber insulation, glass outer-braid, two hundred degrees Celsius rated conductor temperature.

PART 3 - EXECUTION

3.01 INSTRUCTIONS (600 VOLTS)

A. Wire sizes number eight AWG and larger shall be of the stranded type, Class B stranding, and sizes number ten AWG and smaller shall be of the solid type with the exception that all final connections to motors or other vibrating equipment shall be made with stranded wire regardless of size.

B. Use approved lubricants which are non-injurious to insulation when pulling conductors into raceways.

C. Use number twelve AWG minimum wire size with exceptions as noted on the drawings or as stated herein. Homeruns of 20 ampere circuits in excess of one hundred feet shall be number ten AWG minimum size even if not shown on the drawings.

D. Use stranded conductors for final connections to motors and all vibrating equipment.

E. The following conductor color coding shall be observed:

DUAL VOLTAGE SYSTEMS

120/208 Volts	277/480 Volts
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Purple
Three way and four way travelers - Yellow	
Neutral - White	
Equipment ground - Green	

3.02 SPLICES AND CONNECTIONS (600 VOLTS)

A. Make splices and connections in accessible boxes, gutters or cabinets only. Wire sizes number eight and larger to be spliced only with specific approval of Architect.

B. Use soldered and taped or approved mechanical splice connections on solid wire and pressure type solderless connectors well-taped on stranded conductors. Wire sizes #8 and larger to have pressure tool applied compression-type splice.

C. Use Scotch 3M or approved equal plastic tape over mechanical and/or soldered splices applied in thickness equal to wire insulation.

END OF SECTION

SECTION 26 05 26 GROUNDING AND BONDING SYSTEMS

PART 1 - GENERAL

1.01 GENERAL

A. Grounding and bonding systems shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 INSTRUCTIONS

A. Bonding and grounding of electrical service equipment enclosures, raceways and ground terminals as shown on the drawings and in accordance with Article 250 of the National Electrical Code. All cubicles and conduit of the service equipment shall be bonded together.

B. Service equipment system neutral bus and equipment ground bus shall be grounded to electrodes meeting the requirements of Article 250-81 of NEC. Where available and of proper characteristics, the incoming cold water line shall be one of the electrodes.

C. Equipment grounding terminal (green) of all grounding type receptacles shall be bonded to its enclosure with a properly sized bonding conductor (green) unless the receptacle is approved for self-bonding.

C. Pull into all non-metallic raceways and other raceways where shown on drawings one green equipment grounding conductor, sized the same as the branch circuit conductors or as noted on the drawings and bond this conductor to box ground terminal, receptacle ground terminal (green), ground bus of panel, cabinet and/or enclosures.

E. Where conduits enter an enclosure, use bonding type bushing on conduits through 1-1/4" trade size with #10 AWG copper conductors bonded to all conduits thence to equipment enclosure or ground bus. Conduits in excess of 1-1/4" trade size shall have bronze ground clamps with bonding conductors sized in accordance with National Electrical Code requirements and/or as shown on the drawings.

F. Ground rods shall be 5/8" x 10'-0" copper clad sectional, solid rods. They shall be installed with top 12" below finish grade. Resistance to ground shall not exceed 25 ohms. Connections to ground rods to be by exothermic weld. Where multiple ground rods are indicated or required, they shall be driven six (6) feet apart in a straight line and connected with ground conductor sized as shown and/or per N.E.C. Article 250.

END OF SECTION

SECTION 26 05 33 RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.01 INSTRUCTIONS (METALLIC RACEWAYS)

A. Size conduits as shown on the drawings or where size not shown follow National Electrical Code. Four-wire branch circuit homeruns shall be three fourth inch trade size minimum. Homeruns shall not exceed the number of conductors shown on the drawings unless specific approval is given by the Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTIONS (METALLIC RACEWAYS)

A. All wiring in hot-dipped galvanized rigid steel (GRS) conduit (UL 6), intermediate conduit (IMC) (UL 1242), or electrical metallic tubing (EMT) (UL 797) unless specifically shown otherwise on the drawings or stated herein. Conduit in accordance with the following schedule:

1. In any poured concrete: Hot-dipped galvanized rigid steel conduit or IMC.
2. In masonry walls: Hot-dipped galvanized rigid steel conduit, IMC or EMT.
3. In suspended ceiling construction or non-masonry partitions: Hot-dipped galvanized rigid steel conduit, IMC or EMT.
4. In exposed locations indoors: Hot-dipped galvanized rigid steel conduit, IMC or EMT.
5. In exposed locations out of doors. Hot-dipped galvanized rigid steel conduit or IMC. All conduits in earth shall be hot-dipped galvanized rigid steel coated with polyvinyl, polyethylene or asphaltum. Conduits installed in earth shall be buried a minimum of twenty-four inch to top below finished grade.
6. All feeders shall be run in hot-dipped galvanized rigid steel conduit or IMC. Feeder routing shall follow shortest route possible within other requirements herein specified.
7. Conduit in excess of one and one fourth inch trade size shall be hot-dipped galvanized rigid steel conduit or IMC.

2.02 CONDUIT FITTINGS

A. All conduit fittings shall be of steel or malleable iron. Die cast fittings are not acceptable.

B. Rigid Steel and IMC Conduit Fittings:

1. Standard steel or malleable iron threaded couplings, locknuts, bushings, and elbows.
2. Locknuts: Bonding type of steel or malleable iron with sharp edges for digging into the metal wall of an enclosure.
3. Bushings: Insulating type of steel or malleable iron consisting of an insulating insert molded or locked into the metallic body of the fitting. Grounding type with ground lug.

C. EMT Conduit Fittings:

1. Couplings and connectors shall be indentor type or compression type of steel or malleable iron as manufactured by T&B, Appleton or equal. Indentor type shall be secured to each conduit with two operations of tool at right angles.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Conceal all conduits not shown exposed on drawings. Conceal all conduits in partitions unless specifically shown otherwise on drawings or stated herein.

B. Where conduits are shown concealed in concrete slabs in contact with earth, conduits on half inch through on and one fourth inch trade size shall be installed in and not under slabs. Conduits in excess of one and one fourth inch trade size shall be installed under slab and shall have two coats of asphaltum paint applied or shall be coated with polyvinyl, polyethylene or other approved coatings. Where conduit symbol indicates conduit concealed in floor slab and concrete thickness is less than four (4) inches, conduits shall be installed below slab. Conduits shall be routed as required so as not to compromise the structural integrity of any concrete.

C. Run conduits parallel and/or perpendicular to walls, ceilings or floors. Homerun conduits shall be combined to form a common routing path and supported from the building structure by trapeze style hangers.

D. Couple conduits together and connect to boxes, fittings and cabinets so as to provide effective electrical continuity. Do not use couplings dependent on screws bearing on conduit.

E. Provide insulating bushing where conductors number four or larger enter junction box, gutter, cabinet or cutout box. Bushings to be OZ type "BLG", Steel City, Thomas and Betts or equal approved by the Architect.

F. Conduits shall not be routed horizontally on roof without specific approval from Architect. All roof penetrations shall be weatherproofed by Division 7 Contractor. Division 16 Contractor shall be responsible for procuring and coordinating with Division 7 Contractor to perform roof penetrations.

G. Make field bends in conduits in accordance with table in Article 346 of the National Electrical Code.

H. Plug upturned conduits to prevent entrance of moisture or debris and make certain that conduits are clear of same before pulling in wire.

I. Use not to exceed six (6) feet of flexible metal conduit for connection to motors and/or recessed fixtures unless otherwise specified herein. Flexible conduit shall be steel. Flexible conduit used for connections subject to moisture under normal conditions or where specifically indicated or noted shall be liquid tight with proper liquid tight fittings. All flexible conduit shall have properly sized bonding jumper installed within and shall be sized in accordance with Article 250, Table 250-95 of the National Electrical Code.

J. All final connections to motors, transformers or other vibrating equipment shall be with liquid tight flexible conduit.

K. Amply support conduits in accordance with the NEC and as follows:

1. By one-hole or two-hole straps.
2. By at least three rounds of number fourteen B & S gauge galvanized wire twisted around concrete reinforcing rods.

3. By one- or two-hole malleable iron clamps for exposed work held in place by machine screws in expanding lead anchors in concrete or masonry or by screws in wood.
4. By conduit clamps for bar joists.
5. Where groups of conduit occur or for feeder conduits where applicable, by trapeze hangers adequately supported by steel rods attached to concrete inserts, welded supports, bolted supports, etc.
6. Bulb "T" clamps for conduits crossing bulb "T"s.

L. Pull one (1) nylon pull string, minimum one eighth inch diameter, into all empty conduits.

M. Openings around electrical penetrations through smoke-stop or fire-resistance rated walls, partitions, floors or ceilings shall be smoke and/or fire-stopped using approved UL listed system designed for materials encountered to maintain the fire-resistance rating.

N. Expansion fittings in conduits where shown on the drawings or where passing through expansion joints imbedded in concrete. Fittings shall be Crouse-Hinds type XJ complete with type GC100 grounding strap and type GC102 strap clamps or approved equal in Killark or Appleton.

O. Provide seal-off fittings where shown on the drawings or as required by a condition encountered requiring a seal. Seals shall be installed where conduits are installed between areas of different temperatures where condensation may occur. These shall include, but not be limited to, refrigerators, freezers, air-handling units, environmental rooms and building exterior. Seals shall also be installed where conduits enter the building or a piece of equipment and there is a possibility of moisture migration thru the raceway to the equipment or into the building. Fittings shall be Crouse-Hinds type EYS for horizontal and vertical runs, or type EYS elbow seals or approved equal in Killark or Appleton. All seals shall be properly installed using "Chico X" fiber and "Chico A" sealing compound.

P. Assure ground continuity on feeder and branch circuits as stipulated in Article 250 of NEC by two locknuts, one inside and one outside of all boxes, cabinets and gutters.

Q. Wiring gutters shall not be used to combine homeruns to panels unless specifically shown or noted on the drawings.

END OF SECTION

SECTION 26 05 34 BOXES AND FITTINGS

PART 1 - GENERAL

1.01 GENERAL

A. Boxes and fittings shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PROCEDURE

2.01 INSTALLATION PROCEDURES

A. Boxes as manufactured by Steel City, Appleton, Raco or approved equal.

1. Suspended ceiling or wall outlet: four inch octagon by one and one half inch depth, cat. no. 54151.
2. Suspended ceiling or wall outlet: four inch square by one and one half inch depth, cat. no. 52151.
3. Suspended ceiling or wall outlet: four inch square by two and one eighth inch depth, cat. no. 52171.
4. Suspended ceiling or wall outlet: four and eleven sixteenth inch square by two and one eighth inch depth, cat. no. 72171.
5. Switch box: two and one half inch depth cat. no. CL.
6. four inch octagon concrete box, depth as required: Cat. no. 54500 Series with CBP plate and stud.

PART 3 - EXECUTION

3.01 INSTALLATION PROCEDURES

A. Only galvanized stamped steel boxes and covers.

B. Bar hangers or other approved structural supports for all boxes and a three eighths inch steel fixture stud if required by the fixture type.

C. Close all unused knockout holes and install galvanized blank covers on surface boxes and stainless steel covers on flush boxes having no fixture or device.

D. Mount boxes flush to surface. Install plaster rings or special square corner raised covers for tile or block walls so that fixtures or devices will be perfectly flush mounted. Outlet boxes shall not be installed back to back. Boxes shall not be installed more than one fourth behind finish face of wall. Boxes installed in masonry walls shall be embedded in masonry.

E. Location of outlets is approximate unless dimensioned. See architectural or shop drawings for greater accuracy. Any box may be moved up to ten feet by direction of the Architect if so directed before box has been installed.

F. Junction or pull boxes as required by field conditions whether or not shown on the plans. Use Columbia screw cover pull boxes indoors and Hope cast iron boxes out of doors or approved equal. Consult Architect for size and locations. All junction or pull boxes at terminal points shall be labeled with plastic impression tape indicating system being served, feeder, and/or circuit number.

G. Use boxes in accordance with the following schedule and/or in accordance with Article 370 of the National Electrical Code (table below based on use of number twelve AWG) whichever is the larger box required.:

1. Switch box, three inches by two inches by two and one half inches, 5 conductors.
2. Four inch octagon box, one and one half inch depth, 6 conductors.
3. Four inch square box, one and one half inch depth, 9 conductors.
4. Four inch square box, two and one eighth inch depth, 13 conductors.
5. Four and eleven sixteenth inch square, two and one eighth depth, 18 conductors.

H. Watertight junction boxes with hubs in outdoor or damp locations.

3.02 PLATES

A. Plates and/or covers on all boxes and outlets with or without devices. Plates to have all corners in contact with finish wall and shall be horizontal and/or vertical to building surfaces.

B. Plates as manufactured by Pass and Seymour, Bryant, Hubbell, or approved equal to be stainless steel, satin finish, Type 302, eight percent nickel - eighteen percent chrome on all flush outlets.

C. All surface outlets shall have galvanized plates.

D. Certain plates designated by symbol "S" on the drawings shall be indented with red letters one eighth inch high "EMERGENCY SERVICE".

END OF SECTION

SECTION 26 22 00 DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 INSTRUCTIONS

A. Requirements for low voltage shall be supplied by means of dry type transformers which are to be furnished and installed where shown on the drawings and in accordance with these specifications.

PART 2 - PRODUCTS

2.01 INSTRUCTIONS

A. Requirements for low voltage shall be supplied by means of dry type transformers which are to be furnished and installed where shown on the drawings and in accordance with these specifications.

B. Transformers shall be three phase, connected 480 volts delta on the primary and 208Y/120 volts on the secondary, 60 HZ, unless otherwise noted on the drawings.

C. Transformers shall have full rated, two - two and one half percent taps below rated primary voltage and two - two and one half percent taps above rated voltage.

D. Transformers shall be type H construction for continuous operation in a forty degrees Celsius. ambient with a temperature rise not to exceed one hundred fifty degrees Celsius. Sound levels for transformers shall conform to the latest recommended ASA and NEMA Standards.

E. Where noted on the drawings, transformers shall be UL-rated K13 for continuous operation in a forty degrees Celsius. ambient.

F. Dry type transformers shall be as manufactured by General Electric or equal in Square D Company or Siemens.

PART 3 - EXECUTION

3.01 INSTRUCTIONS

A. All dry type transformers 15 KVA and larger shall be wall or floor mounted unless otherwise indicated on the drawings. They shall have neoprene isolation pad between transformer and structure. Final connection to both primary and secondary of transformer to be liquid tight flexible conduit through side near bottom of transformer. Support of suspended transformers shall be from building structure on two and one half inches welded angle iron frame with a minimum of four 1/2" rods securely and safely anchored to building structure. Mount transformers such that minimum clear space from walls, equipment, etc. as recommended by manufacturer is maintained for cooling.

END OF SECTION

SECTION 26 24 00 ELECTRICAL DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 GENERAL

A. Electrical distribution system shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.01 LIGHTING AND POWER PANELBOARDS

A. Shall be dead front construction with solderless pressure terminals.

B. Main and neutral buses of capacity shown or indicated herein to be completely tin and/or silver plated copper or electrical grade aluminum completely tin plated.

C. Circuit breakers shall have bolted connections and shall have minimum interrupting rating and voltage rating as shown on drawings. All single pole 15 and 20 ampere circuit breakers shall be UL listed SWD for switching duty. All circuit breakers rated 15 through 150 amperes serving HVAC equipment shall be UL rated HACR.

D. Circuit breakers shown or noted to be installed in existing panelboards shall be of the same manufacturer and K.A.I.C. rating as existing breakers.

E. Manufacturers shall be General Electric types AQ and AE or equal in Square D Company, Siemens or Cutler Hammer.

2.02 DISTRIBUTION PANELBOARD

A. Shall be dead front construction with solderless pressure terminals.

B. Main and neutral busses of capacity shown or indicated herein to be completely tin and/or silver plated copper or electrical grade aluminum completely tin plated.

C. As shown on the drawings and as specified herein the following distribution equipment.

1. Circuit breaker type panelboard quick-make/quick-break, of proper voltage for system, with frame sizes and characteristics as shown on the drawings.
2. Circuit breakers shown or noted to be installed in existing panelboards shall be of the same manufacturer and K.A.I.C. rating as existing breakers.

D. Manufacturer shall be General Electric Company type SCP or equal in Square D Company, Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.01 LIGHTING AND POWER PANELBOARDS

A. Securely mounted with through bolts anchors or other approved means. Contractor shall provide proper mounting surface if wall of insufficient strength. All wood or other flammable mounting surfaces shall be painted with two coats of flame resistant paint.

B. Complete typewritten directory with transparent plastic cover inside of door. All panels shall be identified as they are designated on the drawings by three fourths inch plastic nameplate, white with minimum one half inch high black engraved letters, on front face if panel is surface mounted or inside of door if panel is flush mounted.

C. Trim and door with lock and catch with two (2) keys. Keys common to all building panelboards.

D. Mount panelboards with top breaker handle not more than six feet six inches above floor. Installation of flush panels shall not compromise fire rating of walls.

E. Connect the phase wires of homeruns to breakers connected to separate phase busses of the panelboard and maintain approximately equal loads on each bus. Panelboard circuits shall be numbered in sequence vertically down the left side then vertically down the right side and all circuits shall appear in the panel exactly as they are shown on the drawings. Numbering to be consecutive for double or triple section panels. Neutral connections shall be identified by adhesive number tags to identify with their branch circuit phase conductors.

F. Typed copy of circuit directory to be installed for each panelboard and shall be submitted with shop drawing submittal for approval.

G. Lighting and/or power panelboards complete with feeders, branch breakers and branch circuits as scheduled on the drawings.

3.02 DISTRIBUTION PANELBOARD

A. Securely mounted with through bolts anchors or other approved means. Contractor shall provide proper mounting surface if wall of insufficient strength. All wood or other flammable mounting surfaces shall be painted with two coats of flame resistant paint.

B. Cabinets code gauge steel with trim.

C. Complete typewritten directory with transparent plastic cover on face of each circuit breaker. Panel designation as indicated on drawings shall be identified by 3/4 inch plastic nameplate, white with minimum one half inch high, black engraved letters, on face of panel.

D. Bushings on all raceways entering panel. Bushings of substantial insulating type to be OZ type ABLG@ or equal approved by Architect.

E. Mount with top over-current unit not over six feet six inches from floor.

3.03 AUTOMATIC TRANSFER SWITCH

A. The automatic transfer switch (ATS) shall consist of a power transfer module and a microprocessor-based control module, interconnected and coordinated with engine generator set to provide complete automatic transfer operations between the normal and stand-by power sources.

B. ATS shall be rated for the connected generator voltage and phase and with a continuous- duty ampere rating as indicated on the drawings 3 phase, 4 wire with switched neutral. It shall be enclosed in a NEMA 1 wall mounted cabinet. The transfer switch shall be mechanically held on both sides and electrically operated with interlock(s) to ensure only one of the two positions is closed at any time. The ATS shall have a fault current withstand rating as shown on the drawings or if rating not shown, the same rating as the K.A.I.C. rating of the normal service panel. Normally open and normally closed auxiliary contacts (rated at 10 amperes at 480V) shall be provided and connected as required for operation and interface with external systems as shown on the drawings, herein specified, or as required. A manual handle or operator shall be provided.

C. Each normal power source phase and at least one phase of the emergency source shall be monitored by an under-voltage relay with at least one of these relays being a close differential type field adjustable for 75% to 100% pickup (factory set for 95%) and 70% to 90% dropout (factory set at 85%). Anti-single phasing protection shall detect regenerative voltage as a failed source condition. Adjustments shall be made by keypad/keyboard without having to open ATS enclosure door or use of special tools. A voltage-frequency relay shall be provided to lockout transfer of the load to the generator until the generator output has reached 90% of rated voltage and frequency. Transfer switch shall accomplish Ain-phase@ retransfer to the line when the preferred power source returns.

D. Control module shall include programming keypad/keyboard, alpha-numeric display, key-lockable program selector switch, LED status indication and integral programmable clock and calendar. Programmed settings shall be stored in non-volatile EEPROM memory. All programmed features shall be field adjustable without opening ATS enclosure door.

E. Control module shall contain all necessary circuitry, switches, contacts, relays, etc. to perform automatically or manually initiate transfer of load.

F. Control module shall have the following adjustable time delays as a minimum: (a.) transfer to emergency delay (0-5 min.) (b.) transfer back to preferred source delay (0-30 min.).

G. Control module shall include pilot lights that show switch position for normal and emergency and normal and emergency power acceptable. Keypad functions shall include digital voltmeter, digital frequency meter and digital running time meter.

H. The automatic transfer switch shall be as manufactured by Kohler or equal in Onan, Russ Electric or Asco.

END OF SECTION

SECTION 26 27 26 WIRING DEVICES

PART 1 - GENERAL

1.01 GENERAL

A. Wiring devices shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.01 WALL SWITCHES (LINE VOLTAGE)

A. Switches to be as manufactured by Hubbell, as stated, or approved equal in Pass and Seymour (P&S), Arrow Hart or Leviton. Contractor shall verify device color with Architect prior to ordering devices.

Single pole, 20A, 120/277V: Hubbell Cat. No. HBL1221, P&S Cat. No. 20AC1, Arrow Hart Cat. No. 1991, Leviton Cat. No. 1221-2.

Three way, 20A, 120/277V: Hubbell Cat. No. HBL1223, P&S Cat. No. 20AC3, Arrow Hart Cat. No. 1993, Leviton Cat. No. 1223-2.

Four way, 20A, 120/277V: Hubbell Cat. No. HBL1224, P&S Cat. No. 20AC4, Arrow Hart Cat. No. 1994, Leviton Cat. No. 1224-2.

2.02 MISCELLANEOUS SWITCHES

A.. Safety switches and lighting contactors shall be mounted 54" to center of operating handle above the finished floor or finished grade where mounted unless shown or noted otherwise on the drawings. Where safety switch is located behind equipment screen walls, mount switch such that top of the enclosure is six inches below top of screen wall and bottom of enclosure is a minimum of eighteen inches above the finished grade or slab.

B. The following miscellaneous switches/contactors with manufacturer as stated or equal in Square D, Allen Bradley, General Electric or equal approved by Architect:

Item	Mfg.	Cat. No.
Manual motor switch, single pole	Square D	Class 2510, type FO-1
Manual motor switch, double pole	Square D	Class 2510, type FO-2
Safety switch, heavy duty with ground lug	Square D	H200-H300 Series

2.03 RECEPTACLE

A. Convenience outlets and receptacles as manufactured by Hubbell, as stated or equal in Pass and Seymour (P&S), Arrow Hart or Leviton. Contractor shall verify device(s) color with Architect prior to ordering.

Duplex grounding receptacle (construction grade), 20A, 125V: Hubbell Cat. No. CR5362, Pass & Seymour Cat. No. 5362, Arrow Hart Cat. No. 5352, Leviton Cat. No. 5362.

Duplex grounding receptacle, ground fault interrupter type (industrial grade), 20A, 125V:

Hubbell Cat. No. GF5362 (No substitutions).

Duplex grounding receptacle (industrial grade), 20A, 125V, weatherproof, mount in type FD box with plate: Hubbell Cat. No. HBL5362, P&S Cat. No. 5362A, Arrow Hart Cat. No. 5362, Leviton Cat. No. 5362A. Plates shall be equal to Hubbell Cat. No. 5206WO or Cat. No. WP8MHP for permanent or Ain-use@ outdoor cord and plug connections.

Duplex grounding receptacle, weatherproof, ground fault interrupter type (industrial grade), 20A, 125V, mount in type FD box with plate: Hubbell Cat. No. GF5362. Plates shall be Hubbell Cat. No. 5206WO or Cat. No. WP8MHP for permanent or Ain-use@ outdoor cord and plug connections.(No substitutions.)

Duplex grounding receptacle on standby generator(s), red (construction grade), 20A, 125V: Hubbell Cat. No. CR5352R, P&S Cat. No. 5362RED, Arrow Hart Cat. No. 5352R, Leviton Cat. No. 5362R.

Cord reels shall be equal to Appleton RE-7P2G.

PART 3 - EXECUTION

3.01 WALL SWITCHES (LINE VOLTAGE)

A. Flush A.C. tumbler-type ganged together under one non-sectionalized plate in gangable boxes where two or more switches occur at one point. Provide metal barrier within box between all adjacent switches served by circuit conductors of different phases or conductors of a different system.

B. Install switches to cut ungrounded conductors.

C. Wall switches shall be mounted forty-eight inches above finished floor to center of operating handle or as noted on the drawings. Mounting heights may be adjusted slightly to permit cutting of masonry block to the top or bottom of the block course nearest the specified height. All mounting heights shall be consistently cut above or below block coursing such that switches will be the same height above the finished floor. First switch of single or ganged switch bank shall be mounted within twelve inches of door frame and/or edge of door.

D. Lighting control switches shown at door ways shall be mounted adjacent to door ways on opposite side of door from hinges unless prohibited by wall space. Where switches must be mounted on same side of door as hinges, mount switches so as not to be located behind opened door.

3.02 MISCELLANEOUS SWITCHES

A. All devices shall be furnished and installed according to manufacturer's recommendations including NEMA housing suitable for the environment where located.

B. All motor starters shall have thermal overload elements sized to actual motor nameplate amperes or as provided in Article 430, Part C of the National Electrical Code.

C. All safety switches shall be heavy duty as defined by NEMA and shall be of voltage as required by the particular circuit on which they are installed. Each switch shall have indented plastic tape label identifying load served with voltage, horsepower, panel and circuit number. All fused switches shall be fused with Bussman Fusetron dual element type fuse as appropriate to the circuit voltage with size fuse indicated on the drawings.

3.03 RECEPTACLES

A. Convenience outlets and receptacles shall be mounted center line up sixteen inches above finished floor unless shown or noted on the drawings otherwise. Convenience outlets and receptacles located at counters shall be mounted center line up four inches above counter top or backsplash unless shown or noted on the drawings otherwise. Mounting heights may be adjusted slightly to permit cutting of masonry block to the top or bottom of the block course maintaining the minimum specified height. All mounting heights shall be consistently cut above or below block coursing such that receptacles/outlets will be mounted the same height above the finished floor. Adjacent devices to be mounted at same height unless otherwise directed.

B. Carefully review Architectural, Furniture and Interior Design drawings for furniture, casework or millwork. Do not rough-in receptacles behind equipment except where specifically noted. Where receptacle is shown behind equipment, verify proper mounting height with the Architect prior to rough-in.

C. Special purpose receptacles shall be as indicated on the drawings. Each shall be of top specification grade, of proper NEMA configuration for equipment served, and equipped with proper cap completely installed.

END OF SECTION

SECTION 26 51 00 LIGHTING FIXTURES

PART 1 - GENERAL

1.01 GENERAL

A. Lighting Fixtures shall be furnished and installed as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURE REQUIREMENTS

A. Lighting fixture lenses specified by catalog number and/or by descriptive reference shall be virgin acrylic plastic and shall equal or exceed IES-SPI-NEMA test for yellowing factor of not to exceed 3 after 2000 hours exposure in a Fade-o-meter for the standard test conditions. The flat portions of all lenses shall be not less than .125 inches thick and shall weigh not less than eight ounces per square foot.

2.02 LIGHTING FIXTURE LAMPS

A. Lamps of proper size and type in each fixture as manufactured by General Electric, Phillips, Sylvania or equal approved by the Architect.

Incandescent lamps, inside frosted, 120 volts.

Fluorescent lamps, T-8, rapid-start, 32-watts, 2900 lumens, 3500 K.

Fluorescent lamps, single-ended, multi-pin, compact, 3500 K.

Metal halide lamps, phosphor-coated unless otherwise noted.

2.03 FLUORESCENT LIGHTING FIXTURE REQUIREMENTS

A. Fluorescent Solid-State Ballasts. Provide energy-saving, solid-state fluorescent ballast of the full light output type. Electromagnetic interference shall be minimal. Ballasts shall be able to withstand voltage transients in accordance with IEEE C62.41, Category A, for normal and common modes. Minimum power factor shall not be less than 0.90. Ballast shall operate at a frequency not less than 20,000 hertz. Ballast current total harmonic content shall be less than ten percent. Ballast shall have an average input wattage of 65 or less watts when operating 2-32 watt lamps tested in accordance with ANSI C82.2 methods. Ballast shall be compatible for use with energy-saving lamps. All ballast serving fixtures utilizing compact fluorescent type lamps shall have end-of-life circuitry to shut off lamp to prevent lamp damage. Ballast shall be as manufactured by Howard Industries or equal in Magnetek, Advance or Motorola. Furnish one, two, three or four lamp ballasts as indicated or as required by fixture switching.

2.04 HID LIGHTING FIXTURE REQUIREMENTS

A. Ballasts in high-intensity discharge (HID) fixtures which are high-power factor (ninety percent minimum) and of proper voltage for branch circuit encountered or be multi-tap type. All HID ballasts shall be Underwriters Lab accepted and shall meet all requirements of the National Electrical Code.

2.05 LIGHTING FIXTURE SCHEDULE

A. Lighting fixtures mounted with bottom edge above floor as indicated in the fixture schedule. The catalog numbers of recessed fixtures, where applicable, are for fixtures for use in an exposed grid suspension type suspended ceiling. This Contractor is responsible for furnishing fixtures which are proper for the ceiling encountered.

PART 3 - EXECUTION

3.01 LIGHTING FIXTURE REQUIREMENTS

A. All lighting fixtures as shown on the drawings by symbols and defined in fixture schedule. Fixtures shall be furnished with all necessary mounting accessories. The installation of all fixtures shall be complete and safe in full accordance with manufacturer's recommendations and these specifications. This contractor shall provide additional one and one half inches by one and one half inches by twelve ga. channel bridging where necessary to mount lighting fixtures governed by the conditions encountered.

B. Procure fixtures completely factory wired for proper operation in the application shown on the drawings. All fixtures shall be furnished with proper fittings and accessories for installation in the area encountered. This Contractor shall review the Architectural plans and specifications and provide fixtures compatible with the ceiling specified in each area.

C. Recessed fixtures in accordance with Article 410 of the NEC. All recessed fixtures in accessible ceilings shall be connected with one half inch flexible conduit from accessible junction box with sufficient length to allow fixture to be relocated to any adjacent ceiling panel without disconnecting. 3/8" flexible conduit may be used if furnished with the fixture by the manufacturer. All recessed fixtures in non-accessible ceilings, unless otherwise indicated, shall be pre-wired from the factory with junction box for terminating branch circuit conduit.

D. Fixture mounting shall be rigid and independent of ceiling tile and shall be supported from the major structural elements of ceiling system. Recessed fluorescent fixtures requiring a ceiling opening in excess of nine (9) square feet shall be supported independent of the ceiling system. Fixtures mounted to concrete shall be anchored with concrete inserts or other means of similar strength if approved by the Architect.

E. Surface fixtures mounted on combustible ceilings or low density acoustical tile ceilings shall be UL approved for such mounting. Where surface fixtures are served by exposed raceway, fixture shall have surface conduit collar furnished by manufacturer. Surface fixtures mounted on LAT ceiling shall be supported from the major tees and connected via flexible conduit similar to recessed fixtures.

F. Recessed fixtures shall be furnished to properly coordinate with the fire rating of the ceiling. Where fire rating requires covering over fixture housing, ballast of proper temperature rating as recommended by manufacturer, shall be furnished.

END OF SECTION

SECTION 28 05 05 SPECIAL SYSTEMS

PART 1 - GENERAL

1.01 GENERAL

A. The following systems indicated below and specified in detail hereinafter require specialized skill and experience in their installation and shall be furnished and installed by the MDOT's Security Vendor.

Section Number	Title
28 10 00	Electronic Access Control & Intrusion Detection
28 3 00	Video Surveillance

B. **Equipment described in the specifications noted above will be provided and installed by the MDOT Security Vendor thru a separate contract. However, the Contractor is responsible for providing and installing required conduit for communications / power cabling and for providing and installing required power at each location. In addition, the Contractor is responsible for coordinating with the MDOT security vendor throughout all phases of the project to ensure security components are installed in appropriate sequence and timeline to not delay the overall project.**

C. The MDOT Security Vendor that should be coordinated with for this work is shown below:

Infrasafe, Inc.
Curtis Hrncirik, Business Development Manager
12612 Challenger Pkwy, Suite 300, Orlando, FL 32826-2700,
Phone: 407.926.6975, Fax: 407.859.5205

The Contractor shall coordinate with the MDOT security vendor throughout all phases of the project to ensure that correct conduit and power are installed at appropriate locations.

D. COORDINATION DRAWINGS AND APPROVALS: Prior to any conduit installation, the Contractor shall coordinate with the security vendor and submit shop drawings showing locations for all security conduit routing and power location points and power requirements at each location. These drawings shall include approval signatures from both the Contractor and the security Vendor demonstrating that the required coordination has occurred. The drawings shall show each component, all interconnecting wiring with wire size and conduit size, numbering of all terminal strips, all pull or junction boxes, zones where applicable, and any other information which is deemed necessary. The diagram shall be done with drawing instruments so as to be neat, legible and all lettering upper case. CAD drawings may also be used.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 GENERAL

A. System wiring, though not shown on the drawings, shall be furnished and installed in accordance with the intent of the plans and specifications and the one-line diagram. It shall be in conduit, unless otherwise noted. Type, size, and number of cables shall be in accord with manufacturer's recommendations.

B. System component locations shown on the drawings is for estimating purposes only. Actual location shall be coordinated with the architectural finishes encountered, other equipment and structural elements, and shall be properly located for maximum system performance. Furnish all necessary mounting accessories for area involved.

END OF SECTION

SECTION 28 10 00 ELECTRONIC ACCESS CONTROL & INTRUSION DETECTION

PART 1 - GENERAL

1.01 SUMMARY

A. This document covers the installation of a card reader Access Control System (ACS) which will be integrated into MDOT's state wide security system.

B. **The equipment described in this specification will be provided and installed by the MDOT Security Vendor thru a separate contract. However, the Contractor is responsible for providing and installing the required conduit for the communications / power cabling and for providing and installing the required power at each location. In addition, the Contractor is responsible for coordinating with the MDOT security vendor throughout all phases of the project to ensure security components are installed in appropriate sequence and timeline to not delay the overall project.**

C. **The MDOT Security Vendor that should be coordinated with for this work is shown below:**

Infrasafe, Inc.
Curtis Hrncirik, Business Development Manager
12612 Challenger Pkwy, Suite 300, Orlando, FL 32826-2700,
Phone: 407.926.6975, Fax: 407.859.5205

The Contractor shall coordinate with the MDOT security vendor throughout all phases of the project to ensure that the correct conduit and power are installed at the appropriate locations.

D. The security access system shall incorporate the following:

1. System Software
2. Security Panels
3. Power Supplies
4. Card Readers.
5. Door Position Switches
6. Door Control Devices

E. Drawings And Specifications:

1. Contractor shall carefully study the Drawings and Specifications, and shall at once report any error, unforeseen circumstances, inconsistency or omission he may discover.

1.02 PROJECT DEFINITIONS

A. General Definitions:

1. Access Control System (ACS): Electronic door control system which grants access through a door based on valid information on a credential card which is read by a card reader at the door.
2. Badges are credential cards that do not contain data to be read by card readers
3. Credential cards shall store uniquely coded data used by card readers as an Identifier.

4. CCTV: Closed-Circuit Television.
5. Central Station: The main controlling PC or server of the security access system.
6. DPDT: Double pole double throw switch.
7. Security Panel: An intelligent peripheral control unit that uses a computer for controlling its operation and controls directly card readers, locking devices and sensors.
8. Credential: Data assigned to an entity and used to identify that entity. (Card)
9. dpi: Dots per inch.

10. I/O: Input/Output.
11. LAN: Local Area Network.
12. NC: Normally closed contacts
13. NO: Normally open contacts
14. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.
15. ROM: Read-only memory. ROM data is maintained through losses of power.
16. RS-485: TIA/EIA standard for multipoint communications.
17. SPST: Single pole single throw switch
18. TCP/IP: Transport Control Protocol/Internet Protocol incorporated into Microsoft Windows.
19. UPS: Uninterruptible Power Supply.
20. Wiegand:

    a. Patented magnetic principle that uses specially treated wires embedded in the credential card.
    b. Format which a card reader communicates with it respective security panel.

21. Windows: Operating system by Microsoft Corporation.

B. Definitions Contract Language

1. Words that are in common use are used throughout the Drawings and Specifications except:

    a. Words which have well-known technical or trade meanings are used in accordance with such recognized meanings.
    b. Whenever the following listed words and phrases are used, they shall be mutually understood to have the following respective meanings:

        1) The words "as indicated" means: as shown on the Drawings, and in accordance with the Specifications.
        2) The words "as required" means: as required to provide a complete and satisfactory Work in full conformance with the Drawings and Specifications.
        3) The word "Provide" means: furnish, install, connect, test and make ready for use.
        4) The word "Work": The Work is the completed construction required by the Drawings and Specifications, and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.
        5) The word "Furnish" means: supply item as specified.
        6) Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site.

7) Project Record Drawings are drawings that completely record and document all aspects and features of the Work. (Also known as "as-built" drawings.)

1.03 REFERENCES

A. NFPA 70 - National Electrical Code

B. UL294 - Standard for Access Control Systems

C. NFPA 72 - National Fire Alarm Code

D. NFPA 101 - Life Safety Code

E. UL 1449 - Surge Protective Devices

1.04 SYSTEM DESCRIPTION

A. The project shall include installing an Advantor INF SFX SV 2 SFX-I Server, Badging Printer and SFX-I software and related equipment.

B. This project shall include the installation of a card reader ACS which shall be compatible with the MDOT security standard.

C. The project shall be controlled from the District Security Center with backup control over the MDOT WAN for the MDOT security center in Jackson.

D. The project shall be based on the Advantor SF/X-I security system.

E. The project includes the installation of card reader and locking devices and accompanying hardware and cabling on the indicated portals.

F. Card readers shall report to the security panel indicated. The new card reader shall be a proximity type card reader compatible with the existing card reader format and communicate with the Advantor security panels.

G. The Advantor Security Panel shall communicate with or control the door hardware. The door hardware includes card readers, electric locking devices , power transfer push buttons, relays and power supplies

H. Door Hardware Interface: Coordinate with the specify door hardware required to be monitored or controlled by the security access system. The Security Panels in this Section shall have electrical characteristics that match the signal and power requirements of door hardware. Integrate door hardware to function with the controls and PC-based software and hardware in this Section.

1.05 SUBMITTALS

A. **COORDINATION DRAWINGS AND APPROVALS: Prior to any conduit installation, the Contractor shall coordinate with the security vendor and submit shop drawings showings the locations for all security conduit routing and power location points and power requirements at each location. These drawings shall include approval signatures from both the Contractor and the security Vendor the demonstrate that the required coordination has occurred. The drawings shall show each component, all interconnecting wiring with wire size and conduit size, numbering of all terminal strips, all pull or junction boxes, zones where applicable, and any other information which is deemed necessary. The diagram shall be done with drawing instruments so as to be neat, legible and all lettering upper case. CAD drawings may also be used.**

B. Product Data (from Security Vendor): Submit nine (9) sets of three binders of manufactures supplied data. Each binder shall contain:

1. Specification/cut sheets for equipment provided.
2. Design guides.
3. Installation and operating instructions.

C. Shop Drawings (from Security Vendor): Submit nine (9) copies of each submittal.

1. Diagrams of cable layout with system labeling schedule.
2. Wiring diagrams.

D. Field quality-control test report showing all card readers, electric locking devices, and intercom devices are installed and functioning correctly.

E. Project Record Drawings:

1. The purpose of Project Record Drawings is to provide factual information regarding all aspects of the Work, to enable future service, modifications, and additions to the Work. They shall include documentation of all Work, including the documentation of existing card format, equipment, wiring, conduits, and raceways.
2. The Contractor will be furnished with two (2) sets of site plans for Contractor's use in preparing Project Record Drawings. One set shall be used as a working set, the other shall be used to prepare the final record set.
3. Project Record Drawings shall accurately show the physical placement of the following:

   a. Equipment and devices
   b. Conduit and raceways.
   c. Junction and pull box locations.
   d. Door hardware, and interface locations.
   e. Project Record Drawings shall show the physical placement of each device and conduit or aerial center line, to be accurate to within one foot of the nearest landmark. Where the site plan conflicts with actual conditions, Contractor shall amend site plan as required. Indicate exact description of conduit runs and cable tray runs
   f. Project Record Drawings shall show wire and cable runs, zone numbers, tamper circuit configuration, panel/circuit breaker numbers from which equipment is powered, and splice points. Such information may be shown on the site plans.

g. Upon completion of Work, and prior to Final Acceptance, Contractor shall prepare and submit final record set of Project Record Drawings. This set shall consist of all data transferred from the working set, supplemented by Riser Diagrams and other information. The final record set of Project Record Drawings shall be drafted by a skilled draftsperson, under the supervision of Contractor. All final Project Record Drawings shall be provided to the MDOT or MDOT's representative.

4 System Documentation:

a. Contractor shall maintain a file of System Documentation at the project site throughout the course of the Work. Such file shall be updated with new information as equipment is received and installed. System Documentation shall be available for inspection on a daily basis.

b. Upon completion of Work, and prior to final Acceptance, Contractor shall prepare and submit three (9) sets of System Documentation.

5. Closeout Submittals:

a. Provide a set Project Record Drawings to the MDOT or MDOT's representative including:

1) As-Built Drawings
2) Mounting Details
3) Product Data
4) Installation Manuals
5) Operating Manuals
6) Maintenance/Service Manuals

1.06 QUALITY ASSURANCE (applies to MDOT Security Vendor)

A. Contractor Minimum Qualifications:

1. Contractor shall be an installation and service contractor regularly engaged in the sale, installation, maintenance and service of Access Control Systems.
2. Contractor shall have five (5) years experience with the installation, start-up and programming of systems of a similar size and complexity to the one proposed.

B. Supervision of Work: Contractor shall employ a competent Foreman to be in responsible charge of the Work. The Foreman shall be on the project site daily during the execution of the Work. The Foreman shall be a regular employee, principle, or officer of the Contractor, who is thoroughly experienced in managing projects of a similar size and type. Contractor shall not use contract employees or Subcontractors as Foremen.

C. Qualifications Of Technicians:

1. All electronic systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of specialty low-voltage electronic systems.
2. Journeyman Wireman electrical workers may be used to install conduit, raceways, wiring, and the like, provided that final termination, hook-up, programming, and testing is performed by a qualified electronic technician, and that all such Work is supervised by the Contractor's Foreman.

3. All incidental Work, such as cutting and patching, lock hardware installation, painting, carpentry, and the like, shall be accomplished by skilled crafts persons regularly engaged in such type of work. All such Work shall comply with the highest standards applicable to that respective industry or craft.
4. All 120 VAC power wiring and connections are to be performed by a qualified Journeyman Wireman, licensed to perform such Work.

D. Subcontractors:

1. Use of any Subcontractor is subject to the approval of the MDOT or MDOT's representative and shall be identified on the Bid Form.
2. The Contractor shall make no substitution for any Subcontractor previously selected without MDOT approval.
3. Contractor's Foreman shall be on the project site daily during all periods when Subcontractors are performing any of the Work. Contractor's Foreman shall be in responsible charge of all Work, including any Work being performed by Subcontractors.
4. By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the contractor by the terms of the Drawings and Specifications, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these documents, assumes.

E. Supervision And Construction Procedures:

1. The Contractor shall supervise and direct the Work, using his best skill and attention. Contractor is solely responsible for all construction means, methods, and techniques.
2. The Contractor shall employ a competent foreman who shall be in attendance at the project site during the progress of the Work. The foreman shall represent the Contractor and all communications given to the foreman shall be as binding as if given to the Contractor.

F. Regulatory Requirements and Permits:

1. All Work shall conform to all applicable building, fire, and electrical codes and ordinances. In case of conflict between the Drawings/Specifications and codes, the codes shall govern. The Contractor shall inform the Project Engineer or the MDOT's representative of any such conflicts.
2. Contractor shall secure and pay for all licenses, permits, plan reviews, engineering certifications, and inspections required by regulatory agencies. Contractor shall prepare, at Contractor's expense, any documents, including drawings that may be required by regulatory agencies.
3. The Contractor shall make application for and obtain any and all permits required by federal, state, county, city, or other authority having jurisdiction over the work.

G. 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.

H. Comply with the following:

1. NFPA 70, "National Electrical Code."
2. NFPA 101, "Life Safety Code."
3. UL294 B Standard for Access Control Systems

1.07 DELIVERY , STORAGE AND HANDLING

A. Security of Contractor's Tools and Equipment: The MDOT or the MDOT's representative is not responsible for the care, storage or security of any of the Contractor's tools or equipment.

1.08 PROJECT / SITE CONDITIONS

A. Environmental Conditions:

1. Dust Control: Make provisions to control all dust, dirt, and foreign material caused by the performance of the Work.
2. Notify MDOT or MDOT's representative immediately of any damage or possible damage to any other equipment.

B. Clean-Up:

1. Contractor shall clean-up, on a daily basis as the Work progresses, all dirt, dust and debris caused by Contractor's operations. Clean-up shall be completed by the end of each workday to the satisfaction of MDOT's on-site representative.
2. In the event that Contractor fails to clean-up, the MDOT or MDOT's representative may elect to have cleanup performed by others, with the costs of such clean-up being charged to the Contractor.

C. Construction Aids:

1. Definition: Construction Aids are facilities and equipment required by personnel to facilitate the execution of the Work. Construction Aids include scaffolds, staging, ladders, platforms, hoists, cranes, lifts, trenchers, core drillers, protective equipment, and other such facilities and equipment.
2. Contractor shall provide all Construction Aids required in the execution of the Work. Construction Aids that are the property of MDOT or other contractors shall not be used without permission.
3. Storage of Construction Aids shall be coordinated with MDOT or MDOT's representative.

D. Safety:

1. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.
2. Contractor shall comply with all local, state, and federal regulations and laws for the safety of the work place.

E. Accident Reports: Serious or fatal accidents shall be reported immediately by telephone or radio to the MDOT or MDOT's representative.

1.09 SEQUENCING

A. Description: This implementation plan describes the general approach that shall be followed in order to minimize the time for the Access Control Systems to be operational.

B. Approach: Contractor and Security Vendor shall plan and schedule all work in such a sequence as to minimize the time before the system is operational. The following is a suggested work sequence:

1. Order all equipment needed and notify any subcontractors to schedule their participation.
2. Perform all system layout work.
3. Insure there are an adequate number of power receptacles available to operate all security equipment and coordinate with MDOT or MDOT's representatives to where power is available.
4. Provide shop drawings to verify location of all equipment, conduit runs, power connections, etc. Submit shop drawings to MDOT or MDOT's representative.
5. Coordinate with MDOT or MDOT's representatives the wall space needed in each of the indicated rooms. Pre-mount Security Panels and Power Supplies on plywood back board.
6. Prepare and pre-test all equipment to the greatest extent possible.
7. Install all equipment.
8. Test and inspect all systems.
9. Perform all other Work as required.
10. Perform the Acceptance Test.
11. Provide training.
12. Provide as-built drawings.

1.10 COMMISSIONING

A. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall coordinate with the security vendor to conduct a final inspection, and pre-test all equipment and system features. Security vendor shall correct any deficiencies discovered as the result of the inspection and pre-test.

B. Contractor and Security Vendor shall submit a request for the Acceptance test in writing to the MDOT's representative no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification that all Work is complete and has been pre-tested, and that all corrections have been made.

C. During Acceptance test, the Security Vendor shall demonstrate all equipment and system features to MDOT. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications may be rejected.

D. Security vendor shall promptly correct all deficiencies. Upon correction of deficiencies, Contractor shall submit a request in writing to MDOT or MDOT's representative for another Acceptance Test.

1.11 MAINTENANCE

A. Provide full procedures for testing battery condition on all security panels and power supplies.

B. Provide full procedures for any other tasks that must be performed to ensure the warranty remains intact.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Advantor contact information:

1. Curtis Hrncirik, Business Development Manager, Infrasafe, Inc.,
12612 Challenger Pkwy, Suite 300, Orlando, FL 32826-2700,
Phone: 407.926.6975, Fax: 407.859.5205

2.02 EQUIPMENT MATERIALS

A. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.

B. All products not provided by MDOT or MDOT's representative shall be new and unused, and shall be of manufacturer's current and standard production.

C. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

2.03 WIRE AND CABLE

A. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.

B. All cables shall be specifically designed for their intended use.

C. Comply with equipment manufacturers recommendations for wire and cable size and type.

D. Comply with all applicable codes and ordinances.

2.04 JUNCTION AND PULL BOXES

A. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. No box shall be smaller than a single gang 1-1/2@ deep. Provide box covers as required.

B. Exterior Boxes: Exterior boxes shall NEMA 4 or NEMA 3R, watertight and dust-tight.

C. All interior and exterior boxes shall have their covers fastened using security screws.

D. Lightning Protection:

1. The Contractor shall provide suitable lightning protection for all security panels.
2. All lightning protection equipment shall be UL listed.

2.05 HEAD END EQUIPMENT

A. Server: Advantor INF SFX SV 2 SFX-I Server

B. Color Badging Printer: Advantor 08504653 DAT 717512 Sp55

C. Advantor SFX-I software and license

2.06 SECURITY PANEL

A. Panel Provider: Advantor:

1. Provide Infraguard panels from Advantor.

2.07 CARD READERS

A. Proximity Card Reader: HID PR-40 Dual iClass/Prox Card Reader Family matching existing or HID Prox Pro I card format and configuration.

2.08 MAGNETIC DOOR CONTACTS

A. Manufacturers:

1. Sentrol; a GE company.
2. Securitron Magnalock Corporation; an ASSA ABLOY Group Company.
3. Dortronics Systems, Inc.

B. Electrical Requirements:

1. Voltage rating: 50 V dc
2. Power rating: 3 watts minim

C. Environmental:

1. Temperature range: -40 to 150 degrees Fahrenheit
2. Shock: 50 G's at 11 milliseconds
3. Reed switch internal atmosphere: dry nitrogen

D. Application:

1. Sensor recessed in top of door:

   a. Sensor Diameter: one inch.
   b. Gap distance in wood: two inches.
   c. Gap distance in steel: one inch.
   d. Electrical Configuration: SPDT
   e. Typical GE R1076W, 1078W or equal
   f. Provide spacers in the steel channel to bring the magnet to with in one half of the gape distance.

2. Sensor surface mount on top door:

   a. Sensor Diameter: one inch.
   b. Gap distance to make: three inches.
   c. Electrical Configuration: SPDT.
   d. Typical GE R1044TW or equal.

3. Doors with thresholds:

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   a. Sensor Diameter: one fourth inch.
   b. Electrical Configuration: NO.
   c. Typical GE R1055W with 1921 magnet or equal.

4. Sensor deeply recessed in top of door:

   a. Sensor Diameter: one inch.
   b. Gap distance in wood: two inches.
   c. Gap distance in steel: Up to one inch.
   d. Electrical Configuration: NO.
   e. Provide bracket to bring magnet to within one fourth inch of switch.
   f. Typical GE 1082TW or equal.

5. Sensor for top or side of overhead or curtain doors:

   a. Gap distance: six inches.
   b. Electrical Configuration: NO.
   c. Typical GE 2515A or equal.

6. Sensor for bottom mounting of overhead or curtain doors:

   a. Gap distance: six inches.
   b. Electrical Configuration: NO.
   c. Typical GE 2204A and 1982 magnet or equal.

2.09 REQUEST TO EXIT PUSH-BUTTON

A. Manufacturers:

1. Securitron Magnalock Corporation; an ASSA ABLOY Group Company.
2. Dortronics Systems, Inc.

B. Electrical Ratings:

1. Minimum continuous current rating of 10 A at 120 V ac or 5 A dc.
2. Contacts that will make or brake 720 VA at 60 A inductive.

C. Enclosures Type:

1. Flush or surface mounting.
2. Single gang.
3. Suitable for flush mounting in the switch enclosures.
4. Plate and switch enclosures shall be stainless-steel.
5. Tamper mounting screws.

D. Push-Button Switches: Momentary-contact.

1. Push Button: two inches or larger mushroom
2. Mounting: Single gang plate
3. Electrical configuration: 1 NO and 1 NC
4. Dortronics Systems Moderl 5216-MP23 or equal

E. Push-Button Pneumatic Switches:

1. Push Button: two inches or larger mushroom.
2. Mounting: Single gang plate.
3. Momentary-contact adjustable delay.
4. Time delay module in compliance with NFPA 101.
5. Electrical configuration: 1 NO and 1 NC.
6. Dortronics Systems Model 5216-MP23DA or equal.

F. Touch Sense Exit Bar:

1. Length: thirty-six inch or forty-eight inches as required.
2. Electrical Configuration: DPDT.
3. Operation Power: 12 or 24 V ac or dc.
4. UL Listed.
5. Securitron TSB-3 Touch Sense Exit Bar or equal.

2.10 DOOR HARDWARE

A. Exit Devices:

1. Type:

a. Rim type devices
b. Electric Mortise type devices

1. Surface mount vertical rod devices
2. Concealed vertical rod devices
3. Three-point latching devices

2. Electrical Configuration

a. 24 V DC operation.
b. Feedback sensors:

1. Electric latch retraction (EL) contacts.
2. Request to exit switch (RX).

3. Von Duprin 98/99 Series or equal.
4. VonDuprin Chexit Electromagnetic Locking Time Delay.

B. Electric Strikes:

1. Coordinate with door hardware, door frame and intended operation
2. Type:

a. Strikes for Rim Exit.
b. Strikes for Mortise and Cylindrical Locks.

3. Von Duprin Series 6000 24 V dc or equal.

C. Magnetic Lock:

1. Holding force one thousand two hundred pounds.
2. Anti tamper switch and fasteners.
3. Voltage 24 V dc.
4. Provide with mounting brackets or spaces as required.
5. Location:

a. Interior Application: Securitron M68 Series or equal.
b. Exterior Application: Securitron M62 Series or equal.

D. Electrical Power Transfer:

1. Type:

a. New Construction: Concealed with in door. Von Duprin EPT-2, EPT-10, GVUX (fire door) or equal
b. Retrofit: Securitron TSB-C or equal.

2.11 CABLES

A. For use in conduit:

1. PVC-Jacketed, provide with adequate number and size for the indicated task.

a. NFPA 70, Type CM.
b. Flame Resistance: UL 1581 Vertical Tray.

B. Interior cable tray or exposed:

1. Plenum-Type, provide with adequate number and size for the indicated task.

a. NFPA 70, Type CMP.
b. Flame Resistance: NFPA 262 Flame Test.

2.12 POWER SUPPLY

A. Manufacturers:

1. Altronix
2. Von Duprin

B. The power supply shall provide power for security panels, electric strikes, magnetic locks and detection devices.

C. Rated at a minimum of 1.2 the current draw of devices served.

D. Coordinate with MDOT or electrical contractor for electrical power requirements.

E. Power supply enclosure:

1. Interior shall be minimum NEMA 1 rated.
2. Exterior shall be minimum NEMA 4 or NEMA 4R rated

F. Individually fused output for each locking device.

G. Input for connection to a UL listed fire alarm output which will upon a fire alarm disconnect lock power to allow free egress.

H. UL Listed for Access Control Systems (UL294).

2.13 NETWORK SWITCH

A. For each network switch required in the project plans, provide network switch meeting the following minimum requirements:

1. Type: Minimum of 24 10/100 Ethernet ports
2. Cisco Catalyst 2950 series network switch or equal

2.14 UNINTERRUPTIBLE POWER SUPPLY

A. Acceptable Manufactures:

1. APC (Schneider).
2. Black Box.
3. Sola.
4. Falcon.

B. Output:

1. Output power capacity: 2700 W/3000 VA.
2. Output voltage: 120 Vac.
3. Full load efficiency: 95 percent.
4. Output power distortion: Less than 5 percent at full load.
5. Output frequency: 57 -63 Hz.
6. Crest factor: Less than 5:1.
7. Waveform type: Sine wave.

C. Input:

1. Voltage: 120 Vac.
2. Frequency: 60 Hz.
3. Input voltage range: 82 -144 Hz.

D. Battery:

1. Type: Lead Acid B Maintenance Free
2. Full recharge time: 3 hr max
3. Backup time half load: Minimum 11 minutes
4. Backup full load: Minimum 3 minutes

E. UPS Management:

1. anel display of load and overload and on battery alarms.
2. Network or active device indication of load and overload and on battery alarms.

F. Filtering and Surge Protection:

1. RF filter.
2. Surge protection.
3. Surge energy rating: 480 Joules.
4. Complies with UL 1449.

G. Physical:

1. Rack Mountable
2. Rack Height 2U

H. Environmental:

1. Operation temperature: 32 B 104 Deg. F.
2. Operating Humidity: 0 to 95 percent non condensing.
3. Noise: Less than 47 dBA at 1 meter for surface.

PART 3 - EXECUTION

3.01 FIELD INSTALLATION

A. Field located security panels where indicated.

B. Mount field hardware (Security Panel, Card Readers, Electrified Locking Devices Locks, Time Delay Electrified Exit Devices, Power Supplies, Push Buttons, Request to Exit Sensors, etc.) and run connecting cables to indicated security panes.

1. Provide card interface module for each card reader.
2. Field locate cables from security panel to security work station.
3. Field locate cable and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other adverse conditions affecting installation.
4. Install, setup and configure all equipment, software and settings for a fully functioning security access control system.

3.02 EXAMINATION

A. Junction and Pull Boxes:

1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. No box shall be smaller than a single gang one and one half inches deep. Provide box covers as required.
2. Exterior Boxes: Exterior boxes shall be NEMA 4 or NEMA 3R, watertight and dust-tight.
3. All interior and exterior boxes shall have their covers fastened using security screws.

B. Lightning Protection:

1. The Contractor shall provide suitable lightning protection for all security panels.
2. All lightning protection equipment shall be UL listed.

C. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

D. Examine roughing-in for LAN and control cable conduit systems to PCs, Security Panels, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 CABLING

A. Layout, size, and plan new wire and cable runs as required.

B. Wire and cable passing through metalwork shall be sleeved by an approved grommet or bushing.

C. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any low-voltage wiring unless the device to be connected comes with a pigtail.

D. Identify all wire and cable at terminations (both ends) and at every junction box. Identification shall be made with an approved permanent label, Brady or equal.

E. Install cables and wiring according to requirements in Division 26 Electrical Specifications.

F. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

G. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

H. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and that ensure Category 5e performance of completed and linked signal paths, end to end. Note Category 6 cable may be used in place of Category 5e if installed to Category 6 performance requirements.

I. Install cables without damaging conductors, shield, or jacket.

J. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

K. Install end-of-line resistors at the field device location and not at the Security Panel or panel location.

3.04 CABLE APPLICATION

A. Wire And Cable Terminations:

1. Identify all inputs and outputs on terminal strips with permanent marking labels.
2. Neatly dress and tie all wiring. The length of conductors within enclosures shall be sufficient to neatly train the conductor to the terminal point with no excess. Run all wire and cable parallel or normal to walls, floors and ground.
3. Install connectors as required by equipment manufacturers.
4. Do not obstruct equipment controls or indicators with wire or cable.
5. Route wire and cable away from heat producing components such as resistors, regulators, and the like.
6. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
7. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

B. Conduit And Raceway Installation:

1. Lay-out, size and plan conduit and raceway systems as indicated or as required.
2. Route exposed conduit and raceway parallel and perpendicular to walls and adjacent piping.
3. Maintain minimum six inch clearance between conduit and piping.
4. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
5. Use conduit bodies to make sharp changes in direction, as around beams. Fasten conduits and raceways to structural steel using approved spring clips or clamps.
6. No exposed conduit, raceway, or junction box shall be installed within any populated area.
7. Install all boxes, card reader, intercoms and push buttons straight and plumb.
8. Do not support conduit from mechanical, plumbing, or fire sprinkler systems.
9. Do not use flexible conduit in lengths longer than six feet.

C. Penetrations: When penetrating a fire wall for passage of cables and/or conduit, provide a fire-stop system that complies with code and the local authority having jurisdiction.

D. Card Readers:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install umber twenty-two AWG wire if maximum distance from Security Panel to the reader is two hundred fifty feet or less.,

E. Install minimum number sixteen AWG cable from Security Panel to electrically powered locks and from power supplies to locks or Security Panels.

3.05 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements of TIA/EIA-606.

B. Cable Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.06 SYSTEM SOFTWARE

A. Provide and install Advantor SF/X-I software. Configure software to meet project requirements. Develop, install, and test databases for the complete and proper operation of systems involved. Assign software license to MDOT.

3.07 FIELD QUALITY CONTROL

A. During the Formal Test & Inspection (Commissioning) of the system, have personnel available with tools and equipment to remove devices from their mounts to inspect wiring connections.

B. Provide wiring diagrams and labeling charts to properly identify all wiring.

C. If corrections are needed, the Contractor shall perform the needed corrections in a timely fashion.

3.08 STARTUP SERVICE

A. Provide an Advantor authorized service representative to supervise and assist with startup service.

B. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

C. Enroll the MDOT provided badges and access information and verify correct operation.

3.09 Demonstration - Training

A. Engage authorized service representative to train MDOT's maintenance personnel to adjust, operate, and maintain security access system.

END OF SECTION

SECTION 28 23 00 VIDEO SURVEILLANCE

PART 1 - GENERAL

1.01 SUMMARY

A. This document covers the installation of a CCTV surveillance system which will also be able to share video information with the MDOT state wide security system.

B. **The equipment described in this specification will be provided and installed by the MDOT Security Vendor thru a separate contract. However, the Contractor is responsible for providing and installing the required conduit for the communications/power cabling and for providing and installing the required power at each location. In addition, the Contractor is responsible for coordinating with the MDOT security vendor throughout all phases of the project to ensure the security components are installed in the appropriate sequence and timeline to not delay the overall project.**

C. **The MDOT Security Vendor that should be coordinated with for this work is shown below:**

Infrasafe, Inc.
Curtis Hrncirik, Business Development Manager
12612 Challenger Pkwy, Suite 300, Orlando, FL 32826-2700,
Phone: 407.926.6975, Fax: 407.859.5205

The Contractor shall coordinate with the MDOT security vendor throughout all phases of the project to ensure correct conduit and power are installed at appropriate locations.

D. The CCTV surveillance system security access system shall incorporate the following:

1. CCTV Cameras
2. Camera Mounts
3. Power Supplies
4. Communication System
5. Digital Video Recorder

E. Drawings And Specifications:

1. Contractor shall carefully study the Drawings and Specifications, and shall at once report any error, unforeseen circumstances, inconsistency or omission he may discover.

1.02 PROJECT DEFINITIONS

A. General Definitions:

1. CCTV: Closed-Circuit Television.
2. DPDT: Double pole double throw switch

3. DVR: Digital Video Recorder
4. I/O: Input/Output.
5. LAN: Local Area Network.
6. NC: Normally closed contacts
7. NO: Normally open contacts
8. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.
9. RS-485: TIA/EIA standard for multipoint communications.
10. SPST: Single pole single throw switch
11. TCP/IP: Transport Control Protocol/Internet Protocol incorporated into Microsoft Windows.
12. TPZ: Tilt Pan Zoon
13. UPS: Uninterruptible Power Supply.
14. Windows: Operating system by Microsoft Corporation.

B. Definitions Contract Language:

1. Words that are in common use are used throughout the Drawings and Specifications except:

a. Words which have well-known technical or trade meanings are used in accordance with such recognized meanings.
b. Whenever the following listed words and phrases are used, they shall be mutually understood

1) The words "as indicated". means: as shown on the Drawings, and in accordance with the Specifications.
2) The words "as required" means: as required to provide a complete and satisfactory Work in full conformance with the Drawings and Specifications.
3) The word "Provide" means: furnish, install, connect, test and make ready for use.
4) The word "Work": The Work is the completed construction required by the Drawings and Specifications, and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.
5) The word "Furnish" means: supply item as specified.
6) Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site.
7) Project Record Drawings or Record Drawings are drawings that completely record and document all aspects and features of the Work. (Also known as "as-built" drawings.)

1.03 REFERENCES

A. NFPA 70 - National Electrical Code

B. UL 1449 - Surge Protective Devices

1.04 SYSTEM DESCRIPTION

A. This project shall include the installation of CCTV cameras, camera mounts, power supplies, cabling, digital video recorder, and monitors that shall be compatible with the MDOT security standard.

B. The CCTV Surveillance System shall be controlled from the District Security Center with video transfer capability over the MDOT WAN to the MDOT security center in Jackson.

1.05 SUBMITTALS

A. **COORDINATION DRAWINGS AND APPROVALS: Prior to any conduit installation, the Contractor shall coordinate with the security vendor and submit shop drawings showings locations for all security conduit routing and power location points and power requirements at each location. These drawings shall include approval signatures from both the Contractor and the security Vendor to demonstrate required coordination has occurred. The drawings shall show each component, all interconnecting wiring with wire size and conduit size, numbering of all terminal strips, all pull or junction boxes, zones where applicable, and any other information which is deemed necessary. The diagram shall be done with drawing instruments so as to be neat, legible and all lettering upper case. CAD drawings may also be used.**

B. Product Data (from Security Vendor): Submit nine (9) sets of three binders of manufactures supplied data. Each binder shall contain:

1. Specification/cut sheets for equipment provided
2. Design guides
3. Installation and operating instructions

C. Shop Drawings (from Security Vendor): Submit nine (9) copies of each submittal.

1. Diagrams of cable layout with system labeling schedule.
2. Wiring diagrams.

D. From Security Vendor: Field quality-control test report showing all cameras and digital video recorders / devices are installed / tested and are functioning correctly.

E. Project Record Drawings:

1. The purpose of Project Record Drawings is to provide factual information regarding all aspects of the Work, to enable future service, modifications, and additions to the Work
2. Project Record Drawings are an important element of this Work. Contractor shall accurately maintain Project Record Drawings throughout the course of this project.
3. Project Record Drawings shall include documentation of all Work, including the camera locations, of setup perimeters, equipment, wiring, and cable runs.
4. The contractor will be furnished with two (2) sets of site plans for Contractor's use in preparing Project Record Drawings. One set shall be used as a working set, the other shall be used to prepare the final record set.

5. Project Record Drawings shall accurately show the physical placement of the following:

   a. Cameras, power supplies, and digital video recorders.
   b. Cable runs
   c. Pull box locations.
   d. Project Record Drawings shall show the physical placement of each camera and conduit to be accurate to within one foot of the nearest landmark. Where the site plan conflicts with actual conditions, Contractor shall amend site plan as required. Indicate exact description of conduit runs and cable tray runs
   e. Project Record Drawings shall show wire and cable runs, camera zone numbers, electrical panel/circuit breaker numbers from which equipment is powered, and splice points. Such information may be shown on the site plans.
   f. Upon completion of Work, and prior to Final Acceptance, Contractor shall prepare and submit final record set of Project Record Drawings. This set shall reflect the installed work.
   g. All final Project Record Drawings shall be provided to the MDOT or MDOT's representative.

6. Closeout Submittals:

   a. Provide a set Project Record Drawings to the Project Engineer including:

      1. Project Record Drawing
      2. Product Data
      3. Installation Manuals
      4. Operating Manuals
      5. Maintenance/Service Manuals

1.06 QUALITY ASSURANCE (applies to MDOT Security Vendor)

A. Contractor Minimum Qualifications:

   1. Contractor shall be an installation and service contractor regularly engaged in the sale, installation, maintenance and service of CCTV Surveillance System.
   2. Contractor shall have five (5) years experience with the installation, start-up and programming of systems of a similar size and complexity to the one proposed.

B. Supervision of Work: Contractor shall employ a competent Foreman to be in responsible charge of the Work. The Foreman shall be on the project site daily during the execution of the Work. The Foreman shall be a regular employee, principle, or officer of the Contractor, who is thoroughly experienced in managing projects of a similar size and type. Contractor shall not use contract employees or Subcontractors as Foremen.

C. Qualifications Of Technicians:

1. All electronic systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of CCTV systems.
2. Journeyman Wireman electrical workers may be used to install conduit, raceways, wiring, and the like, provided that final termination, hook-up, programming, and testing is performed by a qualified electronic technician, and that all such Work is supervised by the Contractor's Foreman.
3. All incidental Work, such as cutting and patching, lock hardware installation, painting, carpentry, and the like, shall be accomplished by skilled crafts persons regularly engaged in such type of work. All such Work shall comply with the highest standards applicable to that respective industry or craft.
4. All 120 VAC power wiring and connections are to be performed by a qualified Journeyman Wireman, licensed to perform such Work.

D. Subcontractors:

1. Use of any Subcontractor is subject to the approval of the MDOT or MDOT's representative and shall be identified at the time of Bid submittal.
2. The Contractor shall make no substitution for any Subcontractor previously selected without MDOT approval.
3. Contractor's Foreman shall be on the project site daily during all periods when Subcontractors are performing any of the Work. Contractor's Foreman shall be in responsible charge of all Work, including any Work being performed by Subcontractors.
4. By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the contractor by the terms of the Drawings and Specifications, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these documents, assumes.

E. Supervision and Construction Procedures:

1. The Contractor shall supervise and direct the Work, using his best skill and attention. Contractor is solely responsible for all construction means, methods, and techniques.
2. The Contractor shall employ a competent foreman who shall be in attendance at the project site during the progress of the Work. The foreman shall represent the Contractor and all communications given to the foreman shall be as binding as if given to the Contractor.

F. Regulatory Requirements and Permits:

1. All Work shall conform to all applicable building, fire, and electrical codes and ordinances. In case of conflict between the Drawings/Specifications and codes, the codes shall govern. The Contractor shall inform the MDOT's representative of any such conflicts.
2. Contractor shall secure and pay for all licenses, permits, plan reviews, engineering certifications, and inspections required by regulatory agencies. Contractor shall prepare, at Contractor's expense, any documents, including drawings, that may be required by regulatory agencies.
3. The Contractor shall make application for and obtain any and all permits required by federal, state, county, city, or other authority having jurisdiction over the work.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Comply with NFPA 70, "National Electrical Code."

1.07 DELIVERY, STORAGE AND HANDLING

A. Security of Contractor's Tools and Equipment: The MDOT or the MDOT's representative is not responsible for the care, storage or security of any of the Contractor's tools or equipment.

1.08 PROJECT/SITE CONDITIONS

A. Environmental Conditions:

1. Dust Control: Make provisions to control all dust, dirt, and foreign material caused by the performance of the Work.
2. Notify MDOT or MDOT's representative immediately of any damage or possible damage to any other equipment.

B. Clean-Up:

1. Contractor shall clean-up, on a daily basis as the Work progresses, all dirt, dust and debris caused by Contractor's operations. Clean-up shall be completed by the end of each workday.
2. In the event that Contractor fails to clean-up, the MDOT or MDOT's representative may elect to have cleanup performed by others, with the costs of such clean-up being charged to the Contractor.

C. Construction Aids:

1. Definition: Construction Aids are facilities and equipment required by personnel to facilitate the execution of the Work. Construction Aids include scaffolds, staging, ladders, platforms, hoists, cranes, lifts, trenchers, core drillers, protective equipment, and other such facilities and equipment.
2. Contractor shall provide all Construction Aids required in the execution of the Work. Construction Aids that are the property of MDOTor other contractors shall not be used without permission.
3. Storage of Construction Aids shall be coordinated with MDOT or MDOT's representative.

D. Safety:

1. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.
2. Contractor shall comply with all local, state, and federal regulations and laws for the safety of the work place.

E. Accident Reports:

1. Serious or fatal accidents shall be reported immediately by telephone or radio to the MDOT or MDOT's representative.

1.09 SEQUENCING

A. Description: This implementation plan describes the general approach that shall be followed in order to minimize the time for the CCTV Surveillance System to be operational.

B. Approach: Contractor and Security Vendor shall plan and schedule all work in such a sequence as to minimize the time before the system is operational. The following is a suggested work sequence:

1. Order all equipment needed and notify any subcontractors to schedule their participation.
2. Insure there are an adequate number of power receptacles available to operate all CCTV equipment and coordinate with MDOT or MDOT's representatives to where power is available.
3. Perform all system layout work.
4. Provide shop drawings to verify location of all equipment, conduit runs, power connections, etc. Submit shop drawings to MDOT or MDOT's representative.
5. Coordinate with MDOT or MDOT's representatives the access to the indicated camera location.
6. Prepare and pre-test all video equipment, set back light compensation to the greatest extent possible.
7. Install all equipment.
8. Test and inspect all systems.
9. Perform all other Work as required.
10. Perform the Acceptance Test.
11. Provide training.
12. Provide as-built drawings.

1.10 COMMISSIONING

A. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall coordinate with security vendor to conduct a final inspection, and pre-test all equipment and system features. Security vendor shall correct any deficiencies discovered as the result of the inspection and pre-test.

B. Contractor and Security Vendor shall submit a request for the Acceptance test in writing to the MDOT's representative no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification that all Work is complete and has been pre-tested, and that all corrections have been made.

C. During Acceptance test, the Security Vendor shall demonstrate all video equipment and system features to MDOT. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications may be rejected.

D. Security Vendor shall promptly correct all deficiencies. Upon correction of deficiencies, Contractor shall submit a request in writing to MDOT or MDOT's representative for another Acceptance Test.

1.11 MAINTENANCE

A. Provide full procedures for testing video quality and alignment.

B. Provide full procedures for any other tasks that must be performed to ensure the warranty remains intact.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.

B. All products not provided by MDOT shall be new and unused, and shall be of manufacturer's current and standard production.

C. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

2.02 CAMERAS

A. Available Manufacturers:

1. COHU
2. Hitachi Visual Technologies.
3. Honeywell
4. JVC Professional Products.
5. Panasonic Security Systems Group.
6. Pelco.
7. Philips Communication, Security & Imaging; Philips Electronics N.V.
8. Samsung Opto-Electronics America, Inc.
9. Sensormatic Electronics Corporation.
10. Toshiba Security Products.
11. Vicon Industries, Inc.
12. Watec America Corporation.

B. Color Fixed Camera (All Interior Installations)

1. Type:
   a. Normal Color Camera
   b. Day Night camera with retractable IR cut filter for night operation
2. Imaging Device: one third inch
3. Minimum Picture Elements:
   a. Normal Color Camera: 768 (H) x 494 (V)
   b. Day Night Color Camera: 720 (H) x 540 (V)
4. Scanning System: 2:1 Interlace.
5. Minimum Horizontal Resolution: 504 TV lines.
6. Signal-to-Noise Ratio: Not less than 50 dB, with the camera AGC off.
7. Sensitivity:
   a. Normal Camera: .3 lux
   b. Day Night Camera:
      1) Day (color): 0.8 lux
      2) Night (B/W) .08 lux
8. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. The illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with the camera AGC off.
9. Manually selectable modes for backlight compensation or normal lighting.
10. White Balance: Auto-tracing white balance, with manually settable fixed balance option.

C. Color Dome Camera: (All Exterior Installations)

1. Assembled and tested as a manufactured unit, containing a dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.

a. Horizontal Resolution: 540 lines.
b. Signal-to-Noise Ratio: Not less than 50 dB, with the camera AGC off.With AGC, manually selectable on or off.

c. Sensitivity: Camera indicated shall be combination day/night cameras.
d. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. The illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with the camera AGC off.
e. Manually selectable modes for backlight compensation or normal lighting.
f. Pan and Tilt: Direct-drive motor, 360-degree rotation angle. Pan-and-tilt speed shall be variable controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
g. Preset positioning: minimum 8 user-definable scenes, each allowing 16-character titles. Controls shall include the following:

1. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
2. Motion detection shall be available at each camera position.
3. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.

h. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
i. Software: Shall include the vendor supplied software necessary to control the Pan, Tilt, Zoom features.

D. Lenses: Optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide lenses for camera manufacture if available.

E. CCTV Camera Mounting:

1. Parapet wall mount B Pelco model PP350 or equal
2. Parapet rooftop mount B Pelco model PP351 or equal
3. Wall mount B Pelco model WM2000 or equal
4. Corner mount adaptor for WM2000 B Pelco model CM100 or equal.

2.03 POWER SUPPLIES

A. Power Supplies: Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, type as recommended by camera manufacturer.

1. Acceptable Manufactures:
a. Pelco
b. Altronix
2. Output Voltage: 24 or 28 Vac selectable

3. Protection Individual camera fuse or circuit barker
4. Enclosure: Power supplies used externally shall be NEMA Type 4X /IP66 rated.
5. Current sized for application with minimal twenty percent safety factor.

2.04 UTP TRANSCEIVERS

A. General Requirements:
1 Type: Passive
2. Input:
a. BNC connector
b. Impedance: 75 Ohm
3 Output:
a. RJ-45 connector or screw terminal
b. Impedance: 100 to 200 Ohm

4. Bandwidth: DC to 8 MHz
5. Max input voltage: 1.1 V p-p
6. Maximum insertion Loss: 2 dB (DC to 8 MHz)
7. Minimum return loss: 15 dB (DC to 8 MHz)
8. Minimum common mode rejection: 40 dB
9. Drive capability:
a. 24 AWG twisted pair
b. Impedance: 100 to 200 Ohm
c. Capacitance: 20 pf/foot

B. UTP Transmitter:

1. Internal to camera UTP 200 ohm output
2. External transmitter: single channel Pelco TW3001P or equal

C. UTP Receivers:

1. Single Channel UTP/Coax Receiver: Pelco TW3001P or equal
2. 8 Channel UTP/Coax Receiver: Pelco TW3008P or equal
3. 16 Channel UTP/Coax Receiver: Pelco TW3016P or equal

2.05 DIGITAL VIDEO RECORDS

A. Available Manufacturers:

1. Dedicated Micros USA.
2. Everfocus
3. Honeywell
4. Integral
5. JVC Professional Products.
6. Panasonic Security Systems Group.
7. Pelco.
8. Philips Communication, Security & Imaging; Philips Electronics N.V.
9. Samsung Opto-Electronics America, Inc.

B. Requirements:

1. Camera Inputs 16 Analog
2. Video input: 1 V p-p at 75 Ohm
3. Monitor Out: 1 BNC Composite 1 V p-p at 75 Ohm.
4. Video Format: NTSC
5. Recording Rate: 480 FPS (NTSC)
6. Compression: MPEG-4 or MJPEG
7. Storage of 500 GB minimum.
8. Storage External:
   a. SCSI connector
   b. Hot swapping
   c. Capacity Minimum 4 position for 2 TB drives
9. Display Resolution: 720 by 480
10. Display Format: 1, 4 and 8 Multiscreen display.
11. Network Interface: Ethernet RJ-45 network connection
12. Intelligent motion detection with programmable area and programmable sensitivity.
13. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
14. Watermark time and date stamp for exported files.
15. Title: Minimum 12 characters for each camera.

2.06 LCD MONITOR

A. Type: Flat panel LCD

B. Size: 19 inches minimum

C. Input: VGA

D. Resolution: Supports up to one thousand two hundred eighty by one thousand twenty-four for SXGA input

E. Brightness: adjustable to 300 cd/m5

F. Minimum Contrast Ratio: 500:1

G. Maximum Response Time: 12 ms

H. Industrial rated for 24 hour times 7 days a week operation

I. Power: 120 V ac at 50 Watts

2.07 WIRE AND CABLE

A. General: Provide all wire and cable required to install systems as indicated.

1. Video cable shall be sized to provide adequate video signal at the recording equipment. The maximum cable length are as follows:

a. RG-59 - 700 feet
b. RG-6 - 1200 feet
c. CAT 5e - 300 feet for network applications
d. CAT 5e - 750 feet for video and TPZ control

2. Wire and cable shall be sized to provide adequate signal for the worst case distance.

B. All cables shall be specifically designed for their intended use.

C. Coax cable with only a foil shield and drain wire shall not be acceptable.

D. Comply with equipment manufacturers recommendations for wire and cable size and type.

E. Comply with all applicable codes and ordinances.

2.08 JUNCTION AND PULL BOXES

A. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. No box shall be smaller than a single gang one and one half inches deep. Provide box covers as required.

B. Exterior Boxes: Exterior boxes shall NEMA 4 or NEMA 3R, watertight and dust-tight.

C. All interior and exterior boxes shall have their covers fastened using security screws.

D. Lightning Protection:

1. The Contractor shall provide suitable lightning protection for all security panels.
2. All lightning protection equipment shall be UL listed.

PART 3 - EXECUTION

3.01 FIELD INSTALLATION

A. Field located security panels where indicated.

B. Mount field camera and power and run connecting cables to indicated.

C. Align cameras as indicted.

D. Set focal length (variable focal length (VFL) lenses) as required to encompass indicated view.

E. Set back light compensation. Use neutral density filters to simulate darkness to set with iris full open.

F. Set focus and depth of field. Set focus to give desired depth of field in lowest light level.

G. Check communication and operation of remote control (PTZ dome camera) Field locate cables form security panel to security work station.

H. Field locate cable and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other adverse conditions affecting installation.

3.02 EXAMINATION

A. Junction and Pull Boxes:

1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. No box shall be smaller than a single gang one and one half inches deep. Provide box covers as required.
2. Exterior Boxes: Exterior boxes shall be NEMA 4 or NEMA 3R, watertight and dust-tight.
3. All interior and exterior boxes shall have their covers fastened using security screws.

B. Lightning Protection:

1. The Contractor shall provide suitable surge protection at both the camera and at the recoding equipment for exterior cameras.
2. Camera on poles or exposed in top of buildings shall have air terminals. The air terminals shall be bonded to the existing lighting protection system.
3. All lightning protection equipment shall be UL listed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 CABLING

A. Layout, size, and plan new wire and cable runs as required.

B. Wire and cable passing through metalwork shall be sleeved by an approved grommet or bushing.

C. All splices shall be made in junction boxes (except at equipment). Power and CAT 5 splices shall be made with an approved crimp connection. Coax cable splices shall be made by first terminating the cable with a coax connector and then using barrel coax cable connectors to join the coax cables. Wire nuts shall not be used on any low-voltage wiring unless the device.

D. Identify all wire and cable at terminations (both ends) and at every junction box. Identification shall be made with an approved permanent label, Brady or equal.

E. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

F. Install coax cables using techniques, practices, and methods that are consistent with coax video cable and that ensure coax video performance of completed and linked signal paths, end to end.

G. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and that ensure Category 5E performance of completed and linked signal paths, end to end.

H. Install cables without damaging conductors, shield, or jacket.

I. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

J. Wire and Cable Terminations:

1. Identify all inputs and outputs on terminal strips with permanent marking labels.
2. Neatly dress and tie all wiring. The length of conductors within enclosures shall be sufficient to neatly train the conductor to the terminal point with no excess. Run all wire and cable parallel or normal to walls, floors and ground.
3. Install connectors as required by equipment manufacturers.
4. Do not obstruct equipment controls or indicators with wire or cable.
5. Route wire and cable away from heat producing components such as resistors, regulators, and the like.
6. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
7. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

K. Conduit and Raceway Installation:

1. Lay-out, size and plan conduit and raceway systems as indicated or as required which ever will allow for the greatest number of cables.
2. Route exposed conduit and raceway parallel and perpendicular to walls and adjacent piping.
3. Maintain minimum six inch clearance between conduit and piping.
4. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
5. Use conduit bodies to make sharp changes in direction, as around beams. Fasten conduits and raceways to structural steel using approved spring clips or clamps.
6. No exposed conduit, raceway, or junction box shall be installed within any populated area.
7. Install all boxes, card reader, intercoms and push buttons straight and plumb.
8. Do not support conduit from mechanical, plumbing, or fire sprinkler systems.
9. Do not use flexible conduit in lengths longer than six feet.

L. Penetrations: When penetrating a fire wall for passage of cables and/or conduit, provide a fire-stop system that complies with code and the local authority having jurisdiction.

M. Camera:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Install coax cable form the camera to the DVR where required.

3.04 IDENTIFICATION

A. Label both ends of each cable. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

B. Label each terminal strip and screw terminal or coax cable connector in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

C. At completion, cable and asset management software shall reflect as-built conditions.

3.05 SYSTEM SOFTWARE

A. Provide and install the DVR software and the CCTV software. Configure software to the project requirements. Assign software licenses to MDOT.

3.06 FIELD QUALITY CONTROL

A. Provide wiring diagrams and labeling charts to properly identify all wiring.

B. Provide a screen capture of each CCTV view.

C. If corrections are needed, the Contractor shall perform the needed corrections in a timely fashion.

3.07 DEMONSTRATION - TRAINING

A. Engage authorized service representative to train MDOT's maintenance personnel to adjust, operate, and maintain CCTV camera system

END OF SECTION

SECTION 31 23 11 EXCAVATION, FILLING AND GRADING FOR BUILDING

PART 1 - GENERAL.

1.01 SECTION INCLUDES

A. The extent of excavation, filling and grading is shown on the Drawings. Preparation of subgrade for building slabs is included as part of this Work. Backfilling of trenches within the building lines is included as part of this Work.

1.02 RELATED SECTIONS

A. Section 01 45 29 – Testing Laboratory Services.

B. Section 31 00 00 – Earthwork.

1.03 SUBMITTALS

A. Notification shall be provided to Project Engineer indicating source of borrow material in advance of start of Work and certification provided that proposed soil material is satisfactory for specified use.

1.04 QUALITY ASSURANCE

A. Perform excavation Work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Compaction density shall be 95 percent of the maximum dry density value as determined by ASTM D 698 (Standard Proctor Test) of AASHTO T-99.

C. Soils compaction control tests shall be performed as specified herein and under Section 01455-Testing Laboratory Services. Stability is defined as absence of significant yielding or pumping of soils under compaction effort.

D. Number of Tests: Make test(s) in accordance with AASHTO T-99 for each class of material. Make in-place density tests in accordance with AASHTO T-238 (Nuclear Method) for density tests, as the fill and backfill work progresses. At least one test per lift of any isolated portions and each footing.

E. Work on Non-Tested Areas: Placing permanent construction over fill that has not been tested and approved may require removal of permanent Work, recompacting the fill and replacing the Work at no additional cost to the Owner.

1.05 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the 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.

B. Do not interrupt existing utilities serving facilities occupied and used by Owner or others except when permitted in writing by Project Engineer and then only after acceptable temporary utility services have been provided. Demolish and completely remove from site existing underground utilities indicated “To Be Removed”. Coordinate with utility companies for shut off of services if lines are active.

1.06 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.07 USE OF EXPLOSIVES

A. The use of explosives is not permitted.

PART 2 - PRODUCTS

2.01 BACKFILL AND FILL

A. Select fill shall be an approved select material free from trash, debris, stones larger than 3 inches, roots and other organic matter.

2.02 GRANULAR FILL

A. Below existing natural grade line: Sandy clay with a liquid limit less than 45 and PI in range of 10 to 22, or clayey sand with PI not less than 7 and liquid limit not greater than 35.

B. Above existing natural grade under slabs and footings: Silty or sandy clay as above or clayey-sand with LL less than 35 and PI of 3 to 15.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the Contractor, in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 EXCAVATION

A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations.

B. Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Project Engineer. Unauthorized excavation, as well as remedial Work directed by the Project Engineer, shall be at the Contractor's expense. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Project Engineer.

D. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Project Engineer.

E. Additional Excavation: When excavation has reached required subgrade elevations, notify the Project Engineer who will make an inspection of conditions. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Project Engineer. Removal of unsuitable material and its replacement as directed will be paid on the basis of contract conditions relative to changes in work.

F. 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. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

G. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

H. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area. 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 subgrade and foundations.

1. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Convey water removed from excavations and rainwater to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

3.03 MATERIAL STORAGE

A. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations. Dispose of excess soil material and waste materials as herein specified.

3.04 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, 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. 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 concrete.

3.06 EXCAVATION FOR TRENCHES

A. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

B. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of the pipe. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.

C. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the Project Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3.07 COLD WEATHER PROTECTION

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

3.08 COMPACTION

A. Control soil compaction during construction providing minimum percentage of density specified for each area classification.

B. Building Slabs: Compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum dry density.

3.09 MOISTURE CONTROL

A. 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. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.10 BACKFILL AND FILL

A. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

B. Under buildings use sub-base material, or satisfactory excavated or borrow material, or combination of both. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance by Project Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and soil treatment.
2 Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork, shoring and bracing, and backfilling of voids with satisfactory materials.
4. Removal of trash and debris.

3.11 GROUND SURFACE PREPARATION

A. When existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.12 PLACEMENT AND COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.

3.13 GRADING

A. 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 shown, or between such points and existing grades.

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

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 COMPACTION

A. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.15 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where subsequent construction operations or adverse weather disturbs completed compacted areas, scarify surface, re-shape, and compact to required density prior to further construction.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of it off the Owner's property.

END OF SECTION

SECTION 31 23 18 EARTHWORK FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Division 1 Sections

1.2 REFERENCES

ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.

ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Granular Subbase: Fill directly beneath slabs-on-grade.

B. Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural Fill: Fill under the structure other than the granular subbase.

1.4 SUBMITTALS

A. Submit sufficient data for verification of the vibratory roller.

1.5 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.6 SURVEY

A. Prior to construction, have structure location staked and certified by a licensed surveyor. If discrepancies between actual lines and elevations exist, notify Architect/Structural Engineer before proceeding with layout of structure.

1.7 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making any subsurface explorations.

1.8 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.9 NOTICE

A. Notify the Architect/Structural Engineer 48 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.1 GRANULAR SUBBASE

A. Granular Subbase: Sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.2 BACKFILL

A. Backfill: Sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.3 STRUCTURAL FILL

A. Structural Fill: Low plasticity silty clay (CL) or sandy clay (CL) with a plasticity index between 10 and 25, at least 50% passing the No. 200 sieve, and a maximum liquid limit of 45.

B. Structural Fill shall be free of organics, debris and deleterious materials.

PART 3 - EXECUTION

3.1 STRIPPING

A. Strip vegetation, topsoil, roots, and other unsuitable material to a depth determined by the Special Inspector but not less than one foot, nor less than 10 feet outside the perimeter of the structure.

B. Stockpile sufficient amounts of topsoil as required to cover areas to be landscaped with a minimum of six inches of material.

3.2 EXCAVATION

A. Excavation shall be considered unclassified. Excavations shall comply with U.S. Department of Labor, Occupation Safety and Health Administration (OSHA) regulations.

B. Perform excavation to the depths and limits in the Structural Drawings and as specified herein.

C. Do not excavate to full depth when there is probability of frost forming or ground freezing in excavation before concrete is placed.

D. Under-cut the entire building area to eight feet below the bottom of the floor slab elevation and extending ten feet outside perimeter walls of all structures at the base of the cut.

E. Ground water may be encountered during the foundation excavation. Provide a system for controlling the ground water to a level at least three feet below the lowest point of the excavation.

F. Keep excavations dry by sloping ground away from holes and trenches.

3.3 PROOFROLLING

A. After stripping or excavation and before any fill placement, fill areas shall be proofrolled with a minimum of two coverages of a loaded dump truck or scraper in each of two perpendicular directions.

B. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

3.4 PLACEMENT OF STRUCTURAL FILL

A. Do not place structural fill on subgrade that contains frost, mud or is frozen.

B. Structural fill shall be placed and compacted in 8 -inch thick loose layers.

C. Compact structural fill to 98 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +3/-3 percent of the optimum moisture content.

D. Scarify each lift of compacted fill prior to placement of the subsequent lift.

3.5 PLACEMENT OF BACKFILL

A. Backfill behind wall shall be placed in layers of six inches.

B. Compact backfill behind walls to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +3/-3 percent of the optimum moisture content.

3.6 PLACEMENT OF GRANULAR SUBBASE

A. Do not place granular subbase on subgrade that contains frost, mud or is frozen.

B. Compact granular subbase to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with the water content within +3/-3 percent of the optimum moisture content.

3.7 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION

SECTION 31 31 16 SOIL TREATMENT FOR TERMITE CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Soil treatment for control of all species of subterranean termites including Formosan termites.

1.02 SUBMITTALS

A. Submit manufacturer's technical product data and application instructions prior to application for Project Engineer's approval. DO NOT submit Material Safety Data Sheets for approval.

B. Submit sample copies of the Termite Soil Treatment Guarantee form prior to application for Project Engineer's approval.

C. Quality Control: Submit identification of at least 3 projects of similar scope along with name, address, and telephone number of the Architect, Owner and General Contractor.

1.03 QUALITY ASSURANCE

A. In addition to the requirements of these Specifications, comply with manufacturer's instructions and recommendations for the Work, including preparation of substrate and application.

B. Engage a professional pest control operator, licensed by the State of Mississippi, Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry, and in accordance with regulations of governing authorities for application of soil treatment solution. The pest control operator is to have the aforementioned valid license, the company technician is to have a valid identification card for pest control, and the company vehicle is to be clearly marked with the company name.

C. The professional pest control operator specializing in Soil Treatment for Termite Control, with 5 years minimum experience, shall have completed work similar to that indicated for this Project and have a record of successful in-service performance.

D. Comply with Mississippi Regulations Governing Pest Control Operators in following the labels of the termiticide.

1.04 PROJECT CONDITIONS

A. 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 other handling and application instructions of the soil toxicant manufacturer.

C. Remove all non-pressure treated wood contacting soil. Remove grade stakes prior to applying horizontal barrier and all form boards, stakes and concrete over pour prior to applying vertical soil treatment.

1.04 GUARANTEE

A. Furnish 3 copies of written guarantee certifying that the applied soil poisoning treatment will prevent the infestation of subterranean termites, including Formosan termites, and that termite contractor will re-treat the soil and also repair or replace any damage caused by termite infestation WITHOUT EXPENSE to the Owner. Provide guarantee for a period of 5 YEARS from the date of treatment, signed by the Applicator and the Contractor.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. Use an emulsible concentrate insecticide for dilution with water specially formulated to prevent infestation by subterranean termites as recommended by the Southern Forest Experiment Station, Forest Insect Laboratory at Gulfport, Mississippi, and registered by the Bureau of Plant Industry for use in structural pest control work. Fuel oil will not be permitted as a diligent. Provide a working solution of one of the following chemical elements:

1. Horizontal barrier: Cypermethrin, Prevail or Talstar.
2. Vertical barrier: Fipronil.

B. Other solutions may be used as recommended by Applicator and if acceptable to local and state governing authorities. Use soil treatment solutions that are not injurious to plants.

PART 3 - EXECUTION

3.01 INSPECTION

A. Applicator must examine the areas and conditions under which soil treatment for termite control is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.

3.02 APPLICATION

A. 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: Under slab-on-grade, suspended slab, foundation footings and other similar structures, treat the soil before concrete slabs are poured using either power sprayer or tank-type garden sprayer. Apply soil treatment solution, USING COLOR DYE MARKING AGENT to insure the area is treated, as follows:

1. Termiticide applied for the prevention of termites shall comply with the manufacturer's label and shall not be applied at concentrations or volumes less than specified on the label.
2. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

C. Allow a minimum of 12 hours for drying after application, before beginning concrete placement or other construction activities.

3.03 PROTECTION

A. Prior to each application, the applicator shall notify the Contractor of the intended application and instruct the responsible person to notify construction workers and other site individuals to leave the treated area and not to return until chemical has been installed into the soil.

B. Post signs in the areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

END OF SECTION

SECTION 31 41 00 TEMPORARY EXCAVATION SHORING OR UNDERPINNING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Division 1 Sections.

B. Section 31 23 18 – Earthwork for Structures.

1.2 BASIS OF PAYMENT

A. Bid price shall include the design, installation, any performance testing required, and any other incidentals necessary to the successful performance of the temporary excavation shoring or underpinning.

1.3 DESIGN REQUIREMENTS

A. Design of temporary excavation shoring or underpinning shall be by a qualified Engineer licensed in the Project state.

B. Temporary excavation shoring or underpinning shall be designed to resist the influence of any surcharge loads from adjacent existing structures, roadways, etc. shown in the Drawings, and shall be designed to prevent damage to the adjacent existing structures, roadways, etc.

1.4 SUBMITTALS

A. Submit certification letter that the design of the temporary excavation shoring meets the requirements of this section.

B. Submit certification letter that the Contractor's qualifications meets the requirements of this section.

C. Architect/Structural Engineer will not review shoring design.

1.5 QUALITY ASSURANCE

A. Execute Work in accordance with local and state regulations and codes and in accordance with the regulations of regulatory agencies having jurisdiction over the Work.

1.6 QUALIFICATIONS

A. Contractor shall be experienced in the successful design and installation of temporary excavation shoring or underpinning of similar size and scope, as evidenced by at least 5 years of applicable experience and the completion of at least 10 similar projects.

1.7 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions.

Owner will not be responsible for interpretation or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making subsurface exploration.

1.8 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping their respective services and facilities in operation. Do not interrupt existing utility service to facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.9 EXISTING STRUCTURES OR ROADWAYS

A. Make complete examination and survey of any existing adjacent structures or roadways to determine all facts necessary to design, install, and monitor the temporary excavation shoring.

B. Contractor shall be responsible for and shall repair any damage to the existing structures or roadways that is related to excavation and shoring.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 41 00 00 CEILING MOUNTED MONORAIL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes ceiling mounted steel monorail including hanger assemblies with sway bracing, electric chain hoist and trolley and electrification system.

B. Related sections

1. Division 05 for overhead support structure from which the ceiling mounted monorail is suspended.
2. Division 26 for electrical supply, disconnect switches, conduit, wiring, and miscellaneous electrical components for power to the monorail mainline power electrification system.

1.02 REFERENCES

A. American Institute of Steel Construction (AISC): Manual of Steel Construction, Part 5, Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts

B. NFPA70: National Electric Code (NEC)

C. American National Standards Institute (ANSI):

1. ANSI B30.11 - Monorails and Underhung Cranes
2. ANSI B30.16 – Safety Standard for Overhead Hoists
3. ANSI/ASME HST-4M – Performance Standards for Electric Chain Hoists

D. ASTM International:

1. ASTM A 36 - Carbon Structural Steel.
2. ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/150 ksi Minimum Tensile Strength.
3. ASTM A 490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

E. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code.
2. AWS D14.1 – Specification for Welding Industrial and Mill Cranes

F. Occupational Safety and Health Administration (OSHA): OSHA Specification 1910.179 - Overhead and Gantry Cranes.

1.03 PERFORMANCE REQUIREMENTS

A. Monorail shall provide linear coverage of length indicated on Drawings and shall consist of the following:

1. Overhead hanger assemblies leaving monorail operating area free of support structures.
2. Rigid monorail.

B. Modular, pre-engineered design: Crane system shall be capable of expansion, disassembly and relocation.

C. Monorail track: Track shall be a structural S-beam with maximum deflection of 1/450 span based on capacity plus dead load for lifting device.

D. Monorail operating temperature: 55 to 110 degrees F., indoor.

E. Monorail shall be designed to withstand the following:

1. Hoist/trolley dead load.
2. Live load capacity equal to rated hook load: 5-Ton (10,000 lb.)
3. Inertia forces from hoist and load movement.

1.04 SUBMITTALS

A. Product data for monorail and accessories. Describe capacities, performance, operation, and applied forces to structure.

B. Shop drawings showing monorail configuration, dimensions, wiring diagrams, and construction and installation details.

C. Manufacturer installation instructions, and operation and maintenance manual.

1.05 QUALITY ASSURANCE

A. Manufacturer: Firm specializing in designing and manufacturing monorails with 5 years successful experience.

B. Installer: Firm experienced in assembly and installation of monorail with 5 years successful experience and acceptable to crane manufacturer.

C. Monorail shall be designed, fabricated, and installed in accordance with AISC.

D. Base monorail structural design to include full rated load capacity plus hoist and trolley dead loads and 25 percent impact factor for speed of lifting device and weight of tooling (as applicable).

E. Perform welding by certified operators in accordance with AWS D14.1.

F. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.

G. Clearly label monorail with rated load capacity. Place label at height and location easily read from floor level and loading position.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Newell Equipment Company

B. Demag Cranes & Components, Houston, TX

C. Or Approved Equal

D. Chain hoist supplier:

1. ACI Hoist and Crane
2. Demag Cranes & Components.
3. Harrington Chain Hoists.

2.02 CEILING MOUNTED MONORAIL

A. Type: Ceiling mounted structural monorail with overhead hanger assemblies, S-beam track, electric chain hoist and motorized trolley, mainline electrification system and bumpers.

B. Monorail length: As indicated.

C. Construction: Fabricate from ASTM A 36 steel sections with finished ends.

1. Hanger assemblies: Provide number and type of hanger assemblies required for suspending monorail from overhead steel beam support structure.

a. Rigid type stools for clamping or bolting directly to the support steel.
b. Monorail track shall be direct bolted to the bottom stool section.
c. Suspension mounting hardware shall be ASTM A 325 mounting bolts.

2. Monorail: Fabricated from structural S-beam shapes.

a. Track: ASTM A 36 structural steels sections with bottom flange of monorail to allow smooth trolley operation.
b. Splice joint: Provide bolted type splice plates to provide flush and level connections at the operating tread of the track.
c. Track and end stops shall be of the bolted type and capable of withstanding the impact of a fully loaded trolley traveling at 50 percent of full load speed.
d. Track curve: Curves shall permit operation of the trolley without binding. Intermediate support locations, as required to be determined by the total trolley load. Curve track sections shall be formed for accuracy and matched up with adjoining track sections.

3. Track electrification: Provide 4-bar enclosed conductor bar electrification.

2.03 MOTORIZED TROLLEY

A. Provide electric trolley for motorized traverse operation.

1. Hoist trolley: Hoist manufacturer’s standard motor-geared trolley provided with drop lugs both sides of trolley to limit trolley drop to 1-inch in the event of wheel axle failure. Trolley to negotiate a 4’-0” radius curve and switch.

B. Speed: Variable Frequency Control with 2-Speeds @ 80 & 20 FPM.

C. Motor: 460V/3ph/60Hz with thermal overload protection.

2.04 ELECTRIC CHAIN HOIST

A. Hoist: 5-ton (10,000 lb.) electric chain hoist with lug mount. Lug mount design shall easily attach to manual push-pull enclosed track trolley.

1. Lift: 25 feet minimum lift.
2. Speed: 2-speed with a Hi & Lo Speed, approximately 20/5 FPM.

3. Gearing: Gearbox shall incorporate helical gearing and be bathed in an oil bath.
4. Motor: High performance motor having multi-pole stator, winding class F insulation with a high to low speed ratio of 4:1.
5. Chain and chain container: Chain shall be of high-strength, hardened age-resistant steel and shall have a minimum safety factor of 5:1. Chain container shall be provided suspended from a pivoting connection, made of tough, flexible and impact-resistant plastic with enough capacity to hold the entire length of chain.
6. Chain sprocket: Chain sprocket shall consist of a minimum of 5 pockets for smooth even lifts.
7. Hoist shall be furnished with a push-button control pendant station with strain relief protection.
8. Electric chain hoist shall comply with all requirements of ANSI B30.11, ANSI B30.16 and N.E.C.

B. Controls: 24-volt control package with transformer, terminal strips, fusing, enclosure, and mounting brackets to be wired to electric chain hoist.

C. Power pick-up collector with tow arm to be mounted and wired to hoist/trolley assembly.

2.05 SHOP FINISHING

A. Clean material of loose rust, mill scale and foreign matter.

B. Paint tracks, hoists, trolleys and hanger assemblies shall be painted one shop coat of manufacturer's standard finish.

C. Provide matching color of air-drying paint for field touchup.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate provision of monorail with:

1. Design and construction of overhead support structure and building framing to receive ceiling mounted monorail as detailed on Drawings and specified in other sections. Ensure that accurate monorail applied forces are provided for structural support design.
2. Provision of electrical supply, conduit, wiring, and other electrical components for powering electrically operated chain hoist and motorized trolley.

B. Prior to installation:

1. Verify that overhead support structure is ready to receive ceiling mounted monorail. Overhead support shall be level and plumb with necessary slotted attachment holes.
2. Verify type and location of power supply.
3. Verify all required components are available and undamaged.

C. Correct other conditions detrimental to the proper or timely completion of this work before proceeding with installation.

3.02 INSTALLATION

A. Install monorail and accessories in accordance with their manufacturer's instructions and approved shop drawings.

B. Do not modify monorail components without advance, written approval from crane manufacturer.

C. Clearances for moving monorail components:

1. Three-inches minimum vertical clearance from any overhead obstruction.
2. Two-inches minimum horizontal clearance from any lateral obstruction.

D. Mark hanger placement on overhead support structure and on monorail in accordance with shop drawings.

E. Hanger assemblies: Assemble rigid support stools with beam clips to monorail track sections. Align and shim as required to ensure monorail is straight and level. Attach lower hanger brackets to monorail.

F. Lift monorail into place and temporarily support. Attach rigid support stool to support structure.

G. Prior to torquing bolts, ensure monorail is:

1. Level to within plus or minus 1/8-inch in 20 feet.
2. Track splice transitions are smooth with no raised areas to inhibit hoist trolley operation.

H. End stops: Bolt stops onto monorail track.

I. Make electrical connections from hoist power pick-up collector to power source.

3.03 FIELD QUALITY CONTROL

A. Move hoist trolley through entire travel to ensure hoist is clear of obstructions and the trolley moves freely and smoothly.

B. Inspect installed monorail to verify that all bolts are torqued.

C. Test hoist trolley and accessories for operating functions. Ensure trolley movement is smooth and proper. Verify electric chain hoist operation and controls function properly. Adjust as required and correct deficiencies.

D. Load test system at 125 percent in field and provide Cal-OSHA certificate.

E. Clean surfaces. If necessary, touch-up paint damage, scratches and blemishes with manufacturer provided matching paint.

F. Protect monorail from other construction operations.

3.04 DEMONSTRATING AND TRAINING

A. Provide demonstration and training session for University's Representative covering operation and maintenance of ceiling mounted work station bridge crane.

END OF SECTION

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-246-3 **CODE: (SP)**

DATE: 11/08/2010

SUBJECT: Sandbags and Rockbags

Section 907-246, Sandbags and Rockbags, is hereby added to and made a part of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as follows.

SECTION 907-246 -- SANDBAGS AND ROCKBAGS

907-246.01--Description. This item of work shall consist of the furnishing, installing, and maintaining sandbags and rockbags for the purpose of temporary erosion control by intercepting and slowing the flow of sediment-laden runoff water, or for use as a temporary dam.

907-246.02--Materials. The filler material for sandbags shall consist of a fine aggregate meeting the requirements of Subsection 703.02. The filler material for rockbags shall consist of a size 57 aggregate meeting the requirements of Subsection 703.03.

The bag material shall be woven polypropylene, polyethylene or polyamide fabric with a minimum unit weight of four (4) ounces per square yard. The bags shall be a minimum of 21 inches in length, 12 inches in width, and four (4) in thickness when filled.

907-246.03--Construction Requirements. Sandbags and rockbags shall be used to construct a berm/dam which will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Sand or rock shall be placed in the bag so that at least the top six (6) inches of the bag is unfilled to allow for proper tying of the open end. Any subsequent rows of bags shall be offset one-half the length of the preceding row to provide a layered brick-type arrangement.

The sandbag and rockbag berm/dam installation shall be maintained in good condition by the Contractor. All necessary work and materials to maintain the integrity of the installation shall be provided until earthwork construction is complete and permanent erosion-control features are in place. The maintenance of the bags will not be paid for separately and will be included in the cost for sandbags or rockbags.

907-246.04--Method of Measurement. Sandbags and rockbags will be measured per linear foot or each.

Sandbags and rockbags measured by the linear foot shall be in accordance with the details in the erosion control drawing. The length of the sandbag or rockbag berm/dam will be measured end-to-end along the cross-section of the ditch in accordance with the erosion control drawing.

907-246.05--Basic of Payment. Sandbags and rockbags, measured as prescribed above, will be

paid for per linear foot or each, which prices shall be full compensation for furnishing bags, fine aggregate, size 57 aggregate, placement of bags, maintenance of the installation, removal and disposal of the sediment deposits and removal after construction has been completed, and for all labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

907-246-A:	Sandbags	- per linear foot or each
907-246-B:	Rockbags	- per linear foot or each

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-282-9 **CODE: (SP)**

DATE: **08/11/2010**

SUBJECT: **Automatic Irrigation System**

Section 907-282, Automatic Irrigation System, is hereby added to and made a part of the 2004 Edition of the Standard Specifications for Road and Bridge Construction as follows.

SECTION 907-282 -- AUTOMATIC IRRIGATION SYSTEM

907-282.01--Description.

907-282.01.1--General. Unless otherwise specified or indicated on the drawings, the construction of the automatic irrigation system shall include the furnishing, installing, and testing of all mains, laterals, risers, and fittings, all municipal water main taps, the furnishing and installing of irrigation heads, drip irrigation equipment, gate valves, controllers, controller enclosures, all necessary specialties and accessories, the removal and/or restoration of existing improvements, excavation and backfill, and all other work in accordance with the plans and specifications as required for a complete system.

The work consists of installing a complete underground irrigation system as shown on the drawings and as hereinafter specified, including the furnishing of all labor, equipment, appliances, and materials and in performing all operations in connection with the construction of the irrigation system. It shall include furnishing and installing all plastic pipe and fittings, automatic control valves, pressure relief valves, check valves, gate valves, valve access boxes, valve markers, manual drain valves, irrigation heads, drip irrigation equipment, electric controllers, electric wire, hydraulic lines, etc., as required for complete system as shown on the drawings, called for in these specifications or as may be required for proper operation of the system.

Sidewalks, roads and other paving adjacent to planting operations shall be kept clean and free of obstructions, mud and debris at all times. Wheels of vehicles used in the work shall be cleaned if necessary. Sidewalks shall be protected from damage and markings from wheels of vehicles used in the work.

Flushing of streets and disposal of dirt or debris into sewers or drainage ditches will not be permitted.

907-282.01.2--Quality Assurance. All local, Municipal and State Laws and Rules and Regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above mentioned Rules, Regulations or requirements and where a conflict may occur, the Rules,

Regulations or requirements of the governing code shall be adhered to. However, when these specifications and/or drawings call for or describe materials, workmanship or construction of better quality, higher standard or larger size, these specifications and/or drawings shall take precedence over the requirements of said Rules, Regulations or Codes.

In addition to complying with all pertinent codes and regulations, the Contractor shall comply with the latest rules of the National Electric Code and local city and county Electrical Codes for all electrical work and materials.

At least one person, thoroughly familiar with the type of materials being installed and the materials manufacturers' recommended methods of installation, shall be present at all times during execution of this work and shall direct all work being performed.

All workers shall have sufficient skill and experience to properly perform the work assigned to them. Workers engaged in special work or skilled work shall have the sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performances as specified and meeting the requirements of the system.

907-282.01.3--Scope of Work. The irrigation system shall be constructed using the irrigation heads, valves, drip irrigation equipment, piping, fittings, controllers, wiring, etc. of sizes and types shown on the drawings and as called for in these specifications or approved equals. The system shall be constructed to grades and conform to areas and locations as shown on the drawings.

It is the intention of these specifications, together with the accompanying drawings, to accomplish the work of installing an irrigation system which will operate in an efficient and satisfactory manner according to the workmanlike standards established for the irrigation system operation. Notwithstanding is the fact that these specifications and drawings may be deficient in setting forth a complete detailed description of the work to be done.

It shall be the Contractor's responsibility to ensure and guarantee coverage of the areas shown on the drawings to be irrigated. The Contractor shall also guarantee the satisfactory operation of the entire system and the workmanship and restoration of the area.

The Contractor shall be responsible for coordination with the local water authority and shall be responsible for any and all permits, fees, tapping charges and other costs required to make the irrigation system completely operational.

907-282.01.4--Warranty. The entire system shall be warranted/guaranteed for a period of six months from the date of final acceptance, and the Contractor hereby agrees to repair or replace any manufacturing or workmanship defects occurring within that six month period, at no additional costs to the State.

During the warranty period, all work not functioning correctly shall be immediately replaced; adjusted as necessary to maintain complete coverage, or make good any other damage, loss, destruction, or failure; at no cost to the State.

Any damage to grade, plants, and other work due to improper irrigation operations or corrective actions shall be corrected or replaced.

Warranty excludes loss due to extraordinary natural phenomena, vandalism or as determined by the Engineer.

Upon completion of all work on the project, the Contractor may request a final inspection of the project. If all items of work, except the completion of a six month warranty period on the irrigation system, are considered satisfactory and acceptable, the Contractor will be given a partial maintenance release. This partial maintenance release is to relieve the Contractor of responsibility, except as stated herein, and to release the Contractor from maintenance on all other items of work on the project during the six month warranty period on the Irrigation System.

907-282.02--Materials.

907-282.02.1--General. Plastic pipe shall be rigid plasticized PVC, extruded from virgin parent material of the type specified on the drawings. The pipe shall be homogenous throughout and free from visible cracks, holes, foreign materials, blisters, deletions, wrinkles and dents.

All pipe shall be continuously and permanently marked with the manufacturer's name and trademark, size schedule and type of pipe, working pressure at 73 degrees Fahrenheit and National Sanitation Foundation (N.S.F.) approval.

All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, or screwed connections. No fittings made of other materials shall be used except as hereinafter specified.

Only solvents complying with ASTM Designation: D 2564 and recommended by the manufacturer of the plastic pipe shall be used for joining.

Only cleaners recommended by the plastic pipe manufacturer shall be used to clean pipe and fittings.

907-282.02.2--Irrigation Heads. Irrigation heads shall be of the required types and sizes and have the diameter or radius of throw, pressure, discharge and any other designations necessary to determine the type and size visibly marked. Irrigation heads shall be by Rain Bird, or approved equal. All heads of a particular type and for a particular function in the system shall be of the same manufacturer and shall be marked with the manufacturer's name and identification in such a position that they can be identified without being removed from the system.

907-282.02.3--Electric Remote Control Valves. All electric remote control valves shall be of the type and size called for by the drawings and shall Rain Bird, or approved equal. Valves shall be twenty-four (24) volt with epoxy-sealed solenoid coils, manual flow control stem and 200 psi rated.

907-282.02.4--Drip Irrigation Equipment. All drip irrigation equipment shall be of the type and size called for by the drawings and shall be Rain Bird, or approved equal.

907-282.02.5--Automatic Controllers. Automatic controllers shall be of the type called for on the drawings or approved equal. Controller shall be by the same manufacturer as selected for the electric remote control valves.

Each automatic controller shall be mounted in a lockable, stainless steel enclosure per the drawing details. Surge and lightning protection shall be incorporated into each controller.

907-282.02.6--Irrigation Head Risers. All irrigation head risers shall be a "swing joint" composed of three street joints and a one (1) inch schedule 80 PVC pipe riser.

907-282.02.7--Double Check Valve. Double check valves shall be designed to accommodate a three (3) inch service line. The valve shall be Watts 709 model or approved equal and shall meet the following standards: ASSEE No. 1015; AWWA C506-78; CSA B64. Valves shall meet all local regulations.

907-282.02.8--Other Materials. All other materials, not specifically described but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds and subject to the approval of the Engineer.

907-282.03--Construction Requirements.

907-282.03.1--Excavation and Backfill. Trenches for plastic pipe sprinkler lines shall be excavated to a sufficient depth and width to permit proper handling and installation of the pipe and fittings, or the piping may be installed by other methods approved by the Engineer.

The backfill shall be properly compacted to eliminate settlement and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are rocky. In rocky areas, the trenching depth shall be two (2) inches below normal trench depth to allow for bedding. The fill dirt or sand shall be used in backfilling to a point four (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three (3) inches. The top six (6) inches of the backfill shall be free of rocks over one (1) inch, subsoil or trash.

Unless otherwise indicated on the drawings or required, all plastic pipe main lines shall be installed with a minimum cover of twenty four (24) inches based upon finished grades. All lateral lines shall be installed with a minimum of eighteen (18) inches of cover.

Layout of piping and heads shown on the plans is approximate and may require adjusting to avoid plants and other obstructions.

907-282.03.2--Pipe Installation. Irrigation lines shown on the drawings are essentially diagrammatic. Locations of all irrigation heads, drip irrigation equipment, valves, piping, wiring, etc., shall be established by the Contractor at the time of construction. Spacing of the irrigation heads are shown on the drawings and shall be exceeded only with the permission of the Engineer.

Layout of piping, irrigation heads, and drip irrigation equipment shown on the plans is approximate and may require adjusting to avoid plants and other constructions.

Pipe sizes shall conform to those shown on the drawings. No substitutes of smaller pipe sizes will be permitted, but substitutions of larger sizes may be approved. All pipe damaged or rejected because of defects shall be immediately removed from the site.

Where piping on the drawings is shown under paved areas but running parallel and adjacent to planted areas or turf areas, the intent of the drawings is to install the piping inside the planted or turf areas.

Generally, piping under concrete or asphalt shall be installed through new Schedule 80 irrigation sleeves to be installed prior to the roadway and bridge construction. Schedule 80 irrigation sleeves must be used when sleeving beneath all roadway travel lanes. Where any cutting or breaking of sidewalks, concrete work and/or asphalt is necessary, it shall be removed and replaced by the Contractor. Permission to cut or break sidewalks, concrete work and/or asphalt shall be obtained from those having proper jurisdiction.

Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.

Plastic pipe shall be cut with a standard pipe cutter or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.

All plastic to plastic joints shall be solvent-weld joints. Only the solvent recommended by the pipe manufacturer shall be used. All plastic pipe and fitting shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility for the correct installation.

All material overages at the completion of the installation are the property of the Contractor and are to be removed from the site.

Piping shall be installed in dry weather when the air temperature is forty (40) degrees Fahrenheit or greater.

907-282.03.3--Solvent-Weld Joints. Solvent-weld joints shall be made in the following manner:

Thoroughly clean the mating pipe and fitting with a clean cloth and liquid cleaning agent. Apply a uniform coat of solvent to the outside of the pipe with an approved applicator.

Apply solvent to the fitting in a similar manner.

Re-apply a light coat of solvent to the pipe and quickly insert it into the fitting.

Give the pipe or fitting a quarter turn to ensure even distribution of the solvent and make sure the pipe is inserted to the full depth of the fitting socket.

Hold in position fifteen (15) seconds.

Wipe off excess solvent that appears at the outer shoulder of the fitting.

Care should be taken so as not to use an excess amount of solvent, thereby causing an obstruction to form on the inside of the pipe. The joints shall be allowed to set at least twenty-four (24) hours before pressure is applied to the system.

907-282.03.4--Concrete Thrust Blocks. Concrete thrust blocks shall be installed on 3-inch irrigation main lines using the dimensions and placement for thrust blocks as indicated on the drawing details.

907-282.03.5--Electric Wiring. All control lines (electric wiring or hydraulic tubing) shall be laid in same trench as plastic pipe.

907-282.03.6--Irrigation Heads. Unless otherwise specified or designated on the drawings, the installation of irrigation heads shall include the excavation and backfill, the furnishing, installing and testing of risers, fittings and pop-up or rotor heads and the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications.

All irrigation heads shall be set perpendicular to the finished grades unless otherwise designated on the drawings or otherwise specified by the Engineer. Irrigation heads shall be located flush with the surrounding finished grades whether that grade be a soil level or the top of installed sod.

Irrigation heads adjacent to existing walls, curbs and other paved areas, shall be set to grade unless the plans show the head to be placed on a riser. Riser height shall be adjusted as needed after planting operations.

Minor adjustments to head locations shall be made after planting operations to ensure optimum coverage.

907-282.03.7--Drip Irrigation Equipment. Unless otherwise specified or designated on the drawings, the installation of all drip irrigation equipment shall include the excavation and backfill, the furnishing, installing and testing of risers, emitters, fittings, diffusers, nozzles, distribution

lines, drip zone valves, and the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications.

All drip irrigation distribution lines, stakes, emitters, and diffuser nozzles shall be established around the trees as designated on the drawings, with tubing stakes equally spaced around the perimeter of each tree, with six per tree. Distribution tubing to each tubing stake shall be completely covered with soil as indicated in the drawing details. Each multi-outlet emitter shall be installed in a subterranean emitter box as indicated in the drawing details.

Minor adjustments shall be made to the layout of distribution tubing or tubing stakes to ensure optimum coverage.

907-282.03.8--Electric Remote Control Valves. Electric remote control valves shall be installed in the manner and location called for by the plan and drawings. Installation shall comply with applicable codes and be done in a workmanlike manner.

907-282.03.9--Automatic Controllers. Install the automatic controller in the location called for by the drawings and in accordance with the manufacturer's recommendations. Installation to comply with applicable codes and to be done in a workmanlike manner.

Contractor shall provide adequate lightning and surge protection for the automatic controller and electric valve solenoids.

The controllers shall receive electrical power at a future date, by others. Therefore, the Contractor shall be responsible for providing a temporary power source for testing the irrigation system. A temporary power source shall also be provided by the Contractor for demonstrating operation of the irrigation system.

907-282.03.10--Testing, Inspection and Repairs. After all new sprinkler piping and risers are in place and connected, for a given section and all necessary work has been completed and prior to the installation of sprinkler heads, all control valves shall be opened and a full head of water used to flush out the system.

Testing of the system shall be performed after completion of each section or completion of the entire installation and any necessary repairs shall be made, at the Contractor's expense, to put the system in good working order.

Temporary power shall be supplied by the Contractor, since electricity will not be available at the time of installation.

Should repairs or adjustments to the irrigation system be required, the Contractor shall backfill any excavation with sandy-loam topsoil. Any landscaping disturbed by these repairs shall be repaired to meet original landscaping specifications. All surrounding landscaped areas shall be protected from excavated materials during the repair process. Sod, grass, or shrubs damaged by excavated material or equipment shall be replaced at the Contractor's expense.

907-282.03.11--Instructions. A typewritten legend shall be attached to the inside of each controller door stating the areas covered by each remote control valve and station on the controller.

After the system has been completed, inspected and approved, maintenance personnel shall be instructed in the operation and maintenance of the irrigation system and demonstrate the contents of the manual furnished.

907-282.04--Method of Measurement. The automatic irrigation system, complete and accepted, will be measured as a lump sum price, as indicated in the construction documents and in the bid schedule of the contract.

907-282.05--Basis of Payment. The automatic irrigation system, measured as prescribed in Subsection 907-282.04, will be paid for at the contract lump sum price bid, which lump sum price shall be full compensation for furnishing and installing the water main taps, double check valves, water meters, vaults for the double check valves and water meters, main water lines, lateral water lines, trenching for all water lines, trench backfill and compaction of trench backfill per specifications, concrete thrust blocks for all 3-inch main lines per construction documents, drip irrigation lines, drip irrigation emitters, emitter stakes, distribution lines for emitters, pop-up sprinklers, turf rotors, irrigation head risers, all necessary nozzles for emitters and irrigation heads, valve boxes, automatic irrigation valves, automatic drip zone valves, gate valves, irrigation controllers in lockable stainless steel pedestal enclosures per construction documents, testing of irrigation system, supply a temporary power source for testing the irrigation system and for demonstrating operation of the irrigation system at the final walk-through inspection, shipping/freight costs; taxes; labor and equipment used for installation, storage and protection of the materials both on-site and off; clean-up and incidentals necessary to complete the irrigation work.

Payment will be made under:

907-282-A: Automatic Irrigation System - per lump sum

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-307-3 **CODE: (IS)**

DATE: **10/08/2007**

SUBJECT: **Lime Treated Courses**

Section 907-307, Lime Treated Courses, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-307.02--Materials.

907-307.02.4--Curing Seals. After "EA-1," in the first sentence of 307.02.4 on page 195, add "AE-P,".

907-307.02.5--Soil-Lime Design. Delete the first paragraph of Subsection 307.02.5 on page 195 and substitute the following:

Quantities and percentages of lime shown on the plans are preliminary. The actual application rate will be established from tests made prior to beginning treatment. The design of soil-lime courses shall be performed by the Central Laboratory. At least 45 days prior to the proposed use of a lime course, the Contractor shall make available materials proposed for use in the mixture for sampling and testing by the Department as the Engineer may consider necessary for the establishment of a mix design.

Changes in source of lime shall not be made without approval. Approval will be based on verification of a mix design.

907-307.03--Construction Requirements.

907-307.03.2--Equipment. Delete the second paragraph of Subsection 307.03.2 on pages 196 & 197.

907-307.05--Basis of Payment. Add the "907" prefix to all pay item numbers listed in Subsection 307.05 on pages 203 & 204.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-401-2

DATE: **01/13/2011**

SUBJECT: **Hot Mix Asphalt (HMA)**

Add the following before 907-401.02.6.2 on page 1.

907-401.02.4--Substitution of Mixture. Delete the table in Subsection 401.02.4 on page 242, and substitute the following:

Mixture	Single Lift Laying Thickness Inches	
	Minimum	Maximum
25 mm	3	4
19 mm	2 ¼	3 ½
12.5 mm	1 ½	2 ½
9.5 mm	1	1 ½
4.75 mm	½	¾

After Subsection 907-401-02.6.2 on page 2, add the following:

907-401.02.6.4.1--Roadway Density. Delete subparagraphs 1., 2., & 3. on page 251 and substitute the following:

1. For all leveling lifts, when full lane width and with a thickness as specified in the table in Subsection 401.02.4, the required lot density shall be 92.0 percent of maximum density.

2. For all single lift overlays, with or without leveling and/or milling, the required lot density shall be 92.0 percent of maximum density.

3. For all multiple lift overlays of two (2) or more lifts excluding leveling lifts, the required lot density of the bottom lift shall be 92. 0 percent of maximum density. The required lot density for all subsequent lifts shall be 93.0 percent of maximum density.

4. For all pavements on new construction, the required lot density for all lifts shall be 93.0 percent of maximum density.

907-401.03.1.2--Tack Coat. Delete the three sentences of Subsection 401.03.1.2 on page 259, and substitute the following:

Tack coat shall be applied to previously placed HMA and between lifts, unless otherwise directed by the Engineer. Tack coat shall be applied with a distributor spray bar. A hand wand

will only be allowed for applying tack coat on ramp pads, irregular shoulder areas, median crossovers, turnouts, or other irregular areas. Bituminous materials and application rates for tack coat shall be as specified in Table 410-A on page 293. Construction requirements shall be in accordance with Subsection 407.03 of the Standard Specifications.

907-401.03.1.4--Density. Delete the first sentence of the first paragraph of Subsection 401.03.1.4 on page 259 and substitute the following:

The lot density for all dense graded pavement lifts, except as provided below for preleveling, wedging [less than fifty percent (50%) of width greater than minimum lift thickness], ramp pads, irregular shoulder areas, median crossovers, turnouts, or other areas where the established rolling pattern cannot be performed, shall not be less than the specified percent (92.0% or 93.0%) of the maximum density based on AASHTO Designation: T 209 for the day's production. For all leveling lifts, when full lane width and with a thickness as specified in the table in Subsection 401.02.4, the required lot density shall be 92.0 percent of maximum density.

907-401.03.9--Material Transfer Equipment. Delete the paragraph in Subsection 401.03.9 on page 264 and substitute the following:

Excluding the areas mentioned below, the material transferred from the hauling unit when placing the top lift, or the top two (2) lifts of a multi-lift HMA pavement with density requirements, shall be remixed prior to being placed in the paver hopper or insert by using an approved Materials Transfer Device. Information on approved devices can be obtained from the State Construction Engineer. Areas excluded from this requirement include: leveling courses, temporary work of short duration, detours, bridge replacement projects having less than 1,000 feet of pavement on each side of the structure, acceleration and deceleration lanes less than 1,000 feet in length, tapered sections, transition sections for width, shoulders less than 10 feet in width, crossovers, ramps, side street returns and other areas designated by the Engineer.

After Subsection 401.03.13 on page 266, add the following:

907-401.03.14--Shoulder Wedge. The Contractor shall attach a device to the screed of the paver that confines the material at the end gate and extrudes the asphalt material in such a way that results in a compacted wedge shape pavement edge of approximately 30 degrees, but not steeper than 35 degrees. The device shall maintain contact between itself and the road shoulder surface and allow for automatic transition to cross roads, driveways, and obstructions. The device shall be used to constrain the asphalt head reducing the area by 10% to 15% increasing the density of the extruded profile. Conventional single plate strike off shall not be used.

The device shall be TransTech Shoulder Wedge Maker, the Advant-Edge, or a similar approved equal device that produces the same wedge consolidation results. Contact information for these wedge shape compaction devices is the following:

1. TransTech Systems, Inc.
   1594 State Street
   Schenectady, NY 12304
   800-724-6306
   www.transtechsys.com

2. Advant-Edge Paving Equipment, LLC
   P.O. Box 9163
   Niskayuna, NY 12309-0163
   518-280-6090
   Contact; Gary D. Antonelli
   Cell: 518-368-5699
   email: garya@nycap.rr.com
   Website: www.advantedgepaving.com

Before using a similar device, the Contractor shall provide proof that the device has been used on previous projects with acceptable results, or construct a test section prior to the beginning of work and demonstrate wedge compaction to the satisfaction of the Engineer. Short sections of handwork will be allowed when necessary for transitions and turnouts, or otherwise authorized by the Engineer.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-401-2 **CODE: (IS)**

DATE: 11/04/2005

SUBJECT: Hot Mix Asphalt (HMA)

Section 401, Hot Mix Asphalt (HMA) - General, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

Delete in toto Subsection 401.02.6.2 on pages 248 and 249, and substitute:

907-401.02.6.2--Assurance Program for Mixture Quality. The Engineer will conduct a quality assurance program. The quality assurance program will be accomplished as follows:

1) Conducting verification tests.
2) Validate Contractor test results.
3) Periodically observing Contractor quality control sampling and testing.
4) Monitoring required quality control charts and test results.
5) Sampling and testing materials at any time and at any point in the production or laydown process.

The rounding of all test results will be in accordance with Subsection 700.04.

The Engineer will conduct verification tests on samples taken by the Contractor under the direct supervision of the Engineer at a time specified by the Engineer. The frequency will be equal to or greater than ten percent (10%) of the tests required for Contractor quality control and the data will be provided to the Contractor within two asphalt mixture production days after the sample has been obtained by the Engineer. At least one sample shall be tested from the first two days of production. All testing and data analysis shall be performed by a Certified Asphalt Technician-I (CAT-I) or by an assistant under the direct supervision of the CAT-I. Certification shall be in accordance with the *MDOT HMA Technician Certification Program* chapter in the Materials Division Inspection, Testing, and Certification Manual. The Department shall post a chart giving the names and telephone numbers for the personnel responsible for the assurance program.

The Engineer shall be allowed to inspect Contractor testing equipment and equipment calibration records to confirm both calibration and condition. The Contractor shall calibrate and correlate all testing equipment in accordance with the latest versions of the Department's Test Methods and AASHTO Designation: R 18.

Random differences between the Engineer's verification tests and the current running average of four quality control tests at the time of obtaining the verification sample will be considered acceptable if within the following limits:

Item	Allowable Differences
Sieve - % Passing	
3/8-inch and above	6.0
No. 4	5.0
No. 8	4.0
No. 16, for 4.75 mm mixtures ONLY	3.5
No. 30	3.5
No. 200	2.0
AC Content	0.4
Specimen Bulk SG, Gmb @ N_{Design}	0.030
Maximum SG, Gmm	0.020

If four quality control tests have not been tested prior to the time of the first verification test, the verification test results will be compared to the average of the preceding quality control tests. If the verification test is the first material tested on the project or if a significant process adjustment was made just prior to the verification test, the verification test results will be compared to the average of four subsequent quality control test results. For all other cases after a significant process adjustment, the verification test results will be compared to the average of the preceding quality control tests (taken after the adjustment) as in the case of a new project start-up when four quality control tests are not available.

In the event that; 1) the comparison of the Contractor's running average quality control data and Engineer's quality assurance verification test results are outside the allowable differences in the above table, or 2) if a bias exists between the results, such that one of the results is predominately higher or lower than the other, and the Engineer's results fail to meet the JMF control limits, the Engineer will investigate the reason immediately. As soon as the need for an investigation becomes known, the Engineer will increase the quality assurance sampling rate to the same frequency required for Contractor testing. The additional samples obtained by the Engineer may be used as part of the investigation process or for routine quality assurance verification tests. The Engineer's investigation may include testing of the remaining quality control split samples, review and observation of the Contractor's testing procedures and equipment, and a comparison of split sample test results by the Contractor quality control laboratory, Department quality assurance laboratory and the Materials Division laboratory. The procedures outlined in the latest edition of MDOT's Field Manual for HMA may be used as a guide for the investigation. In the event that the Contractor's results are determined to be incorrect, the Engineer's results will be used for the quality control data and the appropriate payment for the mixture will be based on the procedures specified in Subsection 401.02.5.8(j).

The Engineer will periodically witness the sampling and testing being performed by the Contractor. The Engineer, both verbally and in writing, will promptly notify the Contractor of any observed deficiencies. When differences exist between the Contractor and the Engineer which cannot be resolved, a decision will be made by the State Materials Engineer, acting as the referee. The Contractor will be promptly notified in writing of the decision. If the deficiencies are not corrected, the Engineer will stop production until corrective action is taken.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-401-4

DATE: 10/05/2010

SUBJECT: Warm Mix Asphalt

Delete Subsection 907-401.03.8 on page 2 and substitute the following:

907-401.03.8--Preparation of Mixture. After the sentence in Subsection 401.03.8 on page 264, add the following:

Warm mix asphalt is defined as a plant produced asphalt mixture that can be produced and constructed at lower temperatures than typical hot mix asphalt. Typical temperature ranges of non-polymer modified, WMA produced by foaming the asphalt binder at the plant are typically 270ºF to 295ºF at the point of discharge of the plant. Typical temperature ranges of polymer modified, WMA produced by foaming the asphalt binder at the plant are typically 280ºF to 305ºF at the point of discharge of the plant. WMA produced by addition of a terminal blended additive may allow the producer to reduce the temperatures below 270ºF as long as all mixture quality and field density requirements are met. Production temperatures at the plant may need to be increased or decreased due to factors such as material characteristics, environmental conditions, and haul time to achieve mixture temperatures at the time of compaction in which uniform mat density can be achieved.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-401-4 **CODE: (SP)**

DATE: 03/22/2010

SUBJECT: Warm Mix Asphalt (WMA)

Section 401, Hot Mix Asphalt (HMA) - General, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as amended by this special provision is applicable to Warm Mix Asphalt Only.

907-401.01--Description. Delete the first and second paragraphs of Subsection 401.01 on page 236, and substitute the following:

These specifications include general requirements for all types of WMA.

This work consists of the construction of one or more lifts of WMA in accordance with these specifications and the specific requirements for the mixture to be produced and in reasonably close conformity with the lines, grades, thicknesses and typical sections shown on the plans or established by the Engineer.

907-401.02--Materials. Delete Subsection 401.02.2 on page 239, and substitute the following:

907-401.02.2--WMA Products and Processes. The Department will maintain a list of qualified WMA products and processes. No product or process shall be used unless it appears on this list.

The Contractor may propose other products or processes for approval by the Product Evaluation Committee. Documentation shall be provided to demonstrate laboratory performance, field performance, and construction experience.

907-401.03--Construction Requirements.

907-401.03.1.1--Weather Limitations. Delete the second sentence of the first paragraph and the Temperature Limitation Table in Subsection 401.03.1.1 on page 258, and substitute the following:

The air and pavement temperature at the time of placement shall equal or exceed 40ºF, regardless of compacted lift thickness.

907-401.03.1.2--Tack Coat. Delete the first sentence of the first paragraph of Subsection 401.03.1.2 on page 259 and substitute the following:

Tack coat shall be applied to previously placed WMA and between lifts, unless otherwise directed by the Engineer.

907-401.03.8--Preparation of Mixture. Delete the sentence in Subsection 401.03.8 on page 264, and substitute the following:

The temperature of the WMA mixture, when discharged from the mixer, shall not exceed 280º F.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-403-4

DATE: **08/03/2010**

SUBJECT: **Hot Mix Asphalt (HMA)**

Before Subsection 907-403.05.2 on page 1, add the following:

Delete the last paragraph of Subsection 403.03.2 at the bottom of page 268, and the table at the top of page 269 and substitute the following:

Regardless of the Surface Profile Index requirement, when the Profile Index for the final surface lift is less than or equal to twenty-two inches per mile (22.0 inches / mile) per segment, a unit price increase will be added. The following schedule lists the Profile Index range and the corresponding contract price adjustment:

Profile Index inches / mile / segment	Contract Price Adjustment percent of unit bid price
less than 10.0	108
10.0 to 14.0	106
14.1 to 18.0	104
18.1 to 22.0	102
22.1 to Required P.I.	100
over Required P.I.	100 (with correction to Required P.I.)

Delete the first full paragraph of Subsection 403.03.2 on page 269 and substitute the following:

Contract price adjustments for rideability shall only be applicable to the surface lift and furthermore to only the segment(s) or portions of the segments(s) of the surface lift that require smoothness be determined by using a profilograph.

Delete Subsection 403.03.5.5 on page 273 and substitute the following:

907-403.03.5.5--Preliminary Leveling. All irregularities of the existing pavement, such as ruts, cross-slope deficiencies, etc., shall be corrected by spot leveling, skin patching, feather edging or a wedge lift in advance of placing the first overall lift.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-403-4 **CODE: (IS)**

DATE: **11/04/2005**

SUBJECT: **Hot Mix Asphalt (HMA)**

Section 403, Hot Bituminous Pavement, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-403.05.2--Pay Items. Add the "907" prefix to the pay items listed on page 275 & 276.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SUPPLEMENT TO SPECIAL PROVISION NO. 907-403-9

DATE: 08/03/2010

SUBJECT: Warm Mix Asphalt (WMA)

After Subsection 907-403.01 on page 1, add the following:

907-403.03.2--Smoothness Tolerances. Delete the last paragraph of Subsection 403.03.2 at the bottom of page 268, and the table at the top of page 269 and substitute the following:

Regardless of the Surface Profile Index requirement, when the Profile Index for the final surface lift is less than or equal to twenty-two inches per mile (22.0 inches / mile) per segment, a unit price increase will be added. The following schedule lists the Profile Index range and the corresponding contract price adjustment:

Profile Index inches / mile / segment	Contract Price Adjustment percent of unit bid price
less than 10.0	108
10.0 to 14.0	106
14.1 to 18.0	104
18.1 to 22.0	102
22.1 to Required P.I.	100
over Required P.I.	100 (with correction to Required P.I.)

Delete the first full paragraph of Subsection 403.03.2 on page 269 and substitute the following:

Contract price adjustments for rideability shall only be applicable to the surface lift and furthermore to only the segment(s) or portions of the segments(s) of the surface lift that require smoothness be determined by using a profilograph.

Delete Subsection 403.03.5.5 on page 273 and substitute the following:

907-403.03.5.5--Preliminary Leveling. All irregularities of the existing pavement, such as ruts, cross-slope deficiencies, etc., shall be corrected by spot leveling, skin patching, feather edging or a wedge lift in advance of placing the first overall lift.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-403-9 **CODE: (SP)**

DATE: 03/15/2010

SUBJECT: Warm Mix Asphalt (WMA)

Section 403, Hot Bituminous Pavement, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as amended by this special provision is applicable to Warm Mix Asphalt Only.

907-403.01--Description. Delete the first sentence of Subsection 403.01 on page 266, and substitute the following:

This work consists of constructing one or more lifts of WMA pavement meeting the requirements of Section 401 on a prepared surface in accordance with the requirements of this section and in reasonably close conformity with the lines, grade, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

907-403.05--Basis of Payment.

907-403.05.2--Pay Items. After the last pay item listed on page 276, add the following:

907-403-M: Warm Mix Asphalt, __(1)__, ___(2)___ - per ton
Type Mixture

907-403-N: Warm Mix Asphalt, __(1)__, ___(3)___, Leveling - per ton
Type Mixture

907-403-O: Warm Mix Asphalt, __(1)__, ___(4)___, Trench Widening - per ton
Type Mixture

907-403-P: Warm Mix Asphalt, HT, ___(3)___, Polymer Modified - per ton
Mixture

907-403-Q: Warm Mix Asphalt, HT, ___(3)___, Polymer Modified, Leveling - per ton
Mixture

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-407-1 **CODE: (SP)**

DATE: 02/26/2008

SUBJECT: Tack Coat

Section 407, Tack Coat, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-407.02.1--Bituminous Material. Delete the second sentence of the first paragraph of Subsection 407.02.1 on page 281, and substitute the following:

When not specified, the materials shall be as specified in Table 410-A on page 293.

907-407.03.3--Application of Bituminous Material. Delete the first paragraph of Subsection 407.03.3 on page 281, and substitute the following.

Tack coat shall be applied with a distributor spray bar. A hand wand will only be allowed for applying tack coat on ramp pads, irregular shoulder areas, median crossovers, turnouts, or other irregular areas. Bituminous materials and application rates for tack coat shall be as specified in Table 410-A on page 293. Tack coat shall not be applied during wet or cold weather, after sunset, or to a wet surface. Emulsions shall be allowed to "break" prior to superimposed construction.

907-407.05--Basis of Payment. Delete the pay item at the end of Subsection 407.05 on page 282, and substitute the following:

907-407-A: Asphalt for Tack Coat * - per gallon

* Grade may be specified

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-501-3 **CODE: (SP)**

DATE: **08/31/2007**

SUBJECT: **Price Adjustment For Thickness**

Section 907-501, Portland Cement Concrete Pavement, of the 2004 Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-501-05.1--General. Delete pay item nos. 501-A, 501-B & 501-C on page 326 and substitute the following.

907-501-A: ___" Reinforced Cement Concrete Pavement, _____ Finish - per square yard

907-501-B: ___" Plain Cement Concrete Pavement, _____ Finish - per square yard

907-501-C: ___" Continuously Reinforced Cement Concrete Pavement, _____ Finish - per square yard

907-501-05.2--Price Adjustment for Thickness. Delete the table in Subsection 501.05.2 on page 327 and substitute the following:

Thickness Deficiency Inches	Proportional Part of Contract Price Allowed
0.0, 0.1, 0.2	100 percent
0.3	80 percent
0.4	72 percent
0.5	68 percent
0.6, 0.7, 0.8	57 percent
0.9, l.0	50 percent

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-601-1 **CODE: (IS)**

DATE: **08/29/2007**

SUBJECT: **Structural Concrete**

Division 600, Incidental Construction, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

After the heading **DIVISION 600 - INCIDENTAL CONSTRUCTION**, add the following:

Unless otherwise specified, all testing of Portland cement concrete in Division 600 shall be in accordance with the requirements of Subsection 907-601.02.1.

907-601.02--Materials.

907-601.02.1--General. Delete the second and third sentence of the first paragraph of Subsection 601.02.1 on page 348, and substitute the following:

Sampling and testing will be in accordance with TMD-20-04-00-000 or TMD-20-05-00-000, as applicable.

907-601.03.6.3--Removal of Falsework, Forms, and Housing. Delete the first paragraph, the table and second paragraph of Subsection 601.03.6.3 on pages 349 and 350, and substitute the following:

The removal of falsework, forms, and the discontinuance of heating, shall be in accordance with the provisions and requirements of Subsection 907-804.03.15, except that the concrete shall conform to the following compressive strength requirements:

Wingwall and Wall Forms not Under Stress	1000 psi
Wall Forms under Stress	2200 psi
Backfill and Cover clear	2400 psi

In lieu of using concrete strength cylinders to determine when falsework, forms, and housings can be removed, an approved maturity meter may be used to determine concrete strengths by inserting probes into concrete placed in a structure. The minimum number of maturity meter probes required for each structural component shall be in accordance with Subsection 907-804.03.15. Procedures for using the maturity meter and developing the strength/maturity relationship shall follow the requirements of Subsection 907-804.03.15. Technicians using the maturity meter or calculating strength/maturity graphs shall meet the requirements of Subsection 907-804.03.15.

907-601.05--Basis of Payment. Add the “907” prefix to the pay items listed on page 352.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-625-1 **CODE: (SP)**

DATE: 05/21/2004

SUBJECT: Painted Traffic Markings

Section 625, Painted Traffic Markings, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-625.04--Method of Measurement. After the last paragraph of Subsection 625.04 on page 442, add the following:

Four-inch traffic stripe markings shall be measured in accordance with Subsection 619.04 for temporary stripe.

907-625.05--Basis of Payment. Add the following pay items to the list of pay items on pages 442 & 443.

907-625-A:	Traffic Stripe, Skip White, 4” Width	- per linear foot or mile
907-625-B:	Traffic Stripe, Skip Yellow, 4” Width	- per linear foot or mile
907-625-C:	Traffic Stripe, Continuous White, 4” Width	- per linear foot or mile
907-625-D:	Traffic Stripe, Continuous Yellow, 4” Width	- per linear foot or mile
907-625-E:	Detail Traffic Stripe, 4” Equivalent Length	- per linear foot
907-625-F:	Legend, 4” Equivalent Length	- per square foot or linear foot

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-625-5 **CODE: (SP)**

DATE: 12/14/2010

SUBJECT: Painted Traffic Markings – Blue-ADA

Section 626, Thermoplastic Traffic Markings, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-626.02--Materials. After the first paragraph of Subsection 626.02.1 on page 443, add the following:

Blue-ADA marking material shall meet the requirements of Section 710 with the exception that the color shall be blue-ADA.

907-626.05--Basis of Payment. Add the following pay items to the list of pay items on pages 442 and 443.

907-625-E: Detail Traffic Stripe, Blue-ADA - per linear foot

907-625-F: Legend, Blue-ADA - per square foot or linear foot

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-701-4 **CODE: (IS)**

DATE: 11/09/2010

SUBJECT: Hydraulic Cement

Section 701, Hydraulic Cement, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

Delete Subsection 701.01 on pages 595 & 596, and substitute the following:

907-701.01--General. The following requirements shall be applicable to hydraulic cement:

Only hydraulic cements conforming to Section 701 shall be used. Hydraulic cements shall not be listed or designated as meeting more than one AASHTO or Department type.

Different brands of hydraulic cement, or the same brand of hydraulic cement from different mills, shall not be mixed or used alternately in any one class of construction or structure, without written permission from the Engineer; except that this requirement will not be applicable to hydraulic cement treatment of design soils, or bases.

The Contractor shall provide suitable means for storing and protecting the hydraulic cement against dampness. Hydraulic cement, which for any reason, has become partially set or which contains lumps of caked hydraulic cement will be rejected. Hydraulic cement salvaged from discarded or used bags shall not be used.

The temperature of bulk hydraulic cement shall not be greater than l65°F at the time of incorporation in the mix.

Acceptance of hydraulic cement will be based on the certification program as described in the Department's Materials Division Inspection, Testing, and Certification Manual and job control sampling and testing as established by Department SOP.

Retests of hydraulic cement may be made for soundness and expansion within 28 days of test failure and, if the hydraulic cement passes, it may be accepted. Hydraulic cement shall not be rejected due to failure to meet the fineness requirements if upon retests after drying at 212°F for one hour, it meets such requirements.

Delete Subsection 701.02 on page 596, and substitute the following:

907-701.02--Portland Cement.

907-701.02.1--General.

907-701.02.1.1--Types of Portland Cement. Portland cement (cement) shall be either Type I or Type II conforming to AASHTO Designation: M85 or Type I(MS), as defined by the description below Table 1. Type III cement conforming to AASHTO Designation: M85 or Type III(MS), as defined by the description below Table 1, may be used for the production of precast or precast-prestressed concrete members.

907-701.02.1.2--Alkali Content. All cement types in this Subsection shall meet the Equivalent alkali content requirement for low-alkali cements listed in AASHTO Designation: M85, Table 2.

907-701.02.2--Replacement by Other Cementitious Materials. The maximum replacement of cement by weight is 25% for fly ash or 50% for ground granulated blast furnace slag (GGBFS). The minimum tolerance for replacement shall be 5% below the maximum replacement content. Replacement contents below this minimum tolerance by fly ash or GGBFS may be used, but shall not be given any special considerations, like the maximum acceptance temperature for Portland cement concrete containing pozzolans. Special considerations shall only apply for replacement of cement by fly ash or GGBFS.

907-701.02.2.1--Portland Cement Concrete Exposed to Soluble Sulfate Conditions or Seawater. When Portland cement concrete is exposed to moderate or severe soluble sulfate conditions, or to seawater, cement types and replacement of cement by Class F fly ash, GGBFS, or silica fume shall be as follows in Table 1.

Table 1- Cementitious Materials for Soluble Sulfate Conditions

Sulfate Exposure	Water-soluble sulfate (SO_4) in soil, % by mass	Sulfate (SO_4)in water, ppm	Cementitious material required*
Moderate and Seawater	0.10 - 0.20	150 - 1,500	Type II **, ***, **** cement, or Type I cement with one of the following replacements of cement by weight: 25% Class F fly ash, 50% GGBFS, or 8% silica fume
Severe	0.20 - 2.00	1,500 - 10,000	Type I cement with a replacement by weight of 50% GGBFS, or Type II ** cement with one of the following replacements of cement by weight: 25% Class F fly ash, 50% GGBFS, or 8% silica fume

* The values listed in this table for replacement of Portland cement by the cementitious materials listed are maximums and shall not be exceeded. The minimum tolerance for replacement shall be 0.5% below the maximum replacement content. Replacement contents below this minimum tolerance by the cementitious materials listed in this table do not meet the requirements for the exposure conditions listed and shall not be allowed.

** Type I cement conforming to AASHTO Designation: M85 with a maximum 8% tricalcium aluminate (C_3A) may be used in lieu of Type II cement; this cement is given the designation "Type I(MS)". Type III cement conforming to AASHTO Designation: M85 with a maximum 8% tricalcium aluminate (C_3A) may be used in lieu of Type II cement as allowed in Subsection 907-701.02.1; this cement is given the designation "Type III(MS)".

*** Blended cement meeting the sulfate resistance requirements of Subsection 907-701.04 may be used in lieu of Type II as allowed in Subsection 907-701.04. No additional cementitious materials shall be added to or as a replacement for blended cement.

**** Class F fly ash or GGBFS may be added as a replacement for cement as allowed in Subsection 907-701.02.2.

Class C fly ash shall not be used as a replacement for cement in any of the sulfate exposure conditions listed above.

907-701.02.2.2--Cement for Soil Stabilization Exposed to Soluble Sulfate Conditions or Seawater. When Portland cement for use in soil stabilization is exposed to moderate or severe soluble sulfate conditions, or to seawater, cement types and replacement of cement by Class F fly ash or GGBFS shall meet the requirements of Subsection 907-701.02.2.1. Neither metakaolin nor silica fume shall be used to bring the cementitious materials into compliance with the requirements of Table 1.

Delete Subsection 701.03 on page 596, and substitute the following:

907-701.03--Masonry Cement. Masonry cement shall conform to ASTM Designation: C 91 and shall only be used in masonry applications.

Delete Subsection 701.04 on page 596, and substitute the following:

907-701.04--Blended Hydraulic Cement.

907-701.04.1--General.

907-701.04.1.1--Types of Blended Cement. Blended hydraulic cements (blended cements) shall be of the following types and conform to AASHTO Designation: M 240:

Type I(SM) – Slag-modified Portland cement
Type IS – Portland blast-furnace slag cement
Type I(PM) – Pozzolan-modified Portland cement
Type IP – Portland-pozzolan cement

Blended cement for use in Portland cement concrete or soil stabilization exposed to the moderate soluble sulfate condition or exposure to seawater as defined in Table 1 shall meet the Sulfate resistance requirement listed in AASHTO Designation: M 240, Table 2 and the "(MS)" suffix shall be added to the type designation.

907-701.04.1.2--Alkali Content. All blended cement types in this Subsection shall meet the Mortar expansion requirements listed in AASHTO Designation: M 240, Table 2.

907-701.04.2--Replacement by Other Cementitious Materials. No additional cementitious materials, such as Portland cement, performance hydraulic cement, fly ash, GGBFS, metakaolin, or others, shall be added to or as a replacement for blended cement.

907-701.04.3--Exposure to Soluble Sulfate Conditions or Seawater. When Portland cement concrete or blended cement for soil stabilization is exposed to moderate soluble sulfate conditions or to seawater, where the moderate soluble sulfate condition is defined in Table 1, the blended cement shall meet the sulfate resistance requirement listed in AASHTO Designation: M 240, Table 2.

When Portland cement concrete or blended cement for soil stabilization is exposed to severe soluble sulfate conditions, where the severe soluble sulfate condition is defined in Table 1, blended cements shall not be used.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-708-5 **CODE: (IS)**

DATE: 05/12/2008

SUBJECT: Non-Metal Drainage Structures

Section 708, Non-Metal Structures and Cattlepasses, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-708.02.1.2--Fly Ash. In the first sentence of Subsection 708.02.1.2 on page 639, change "20 percent" to "25%".

907-708.02.3.2--Marking. Delete the second sentence of Subsection 708.02.3.2 on page 640, and substitute the following:

Machine made pipe shall be marked in accordance with one of the following methods: 1) the pipe shall be inscribed on the outside of the pipe and stenciled on the inside of the pipe, or 2) the pipe shall be inscribed on the inside of the pipe, only. All other pipe may be stenciled.

907-708.17--Corrugated Plastic Pipe Culverts.

907-708.17.1--Corrugated Polyethylene Pipe Culverts. Delete the first sentence of the first paragraph of Subsection 708.17.1 on page 645 and substitute the following.

Corrugated polyethylene pipe shall conform to the requirements of AASHTO Designation: M 294, Type S and/or SP, as applicable, and shall have soil tight joints, unless otherwise specified.

Delete the last sentence of the second paragraph of Subsection 708.17.1 on page 645.

After Subsection 708.17.1 on page 645, add the following:

907-708.17.1.1--Inspection and Final Acceptance of Corrugated Polyethylene Pipe Culverts. Approximately 50% of the installed length of corrugated polyethylene pipe shall be inspected for excess deflection no sooner than 30 days after the embankment material over the pipe is placed to the required subgrade elevation or the maximum required fill height. The inspection shall be performed using either electronic deflectometers, calibrated television or video cameras, or a "go, no-go" mandrel that has an effective diameter of 95% of the nominal inside diameter of the pipe.

Pipe found to have deflection values greater than 5% shall be removed and replaced at no cost to the State.

907-708.17.2--Corrugated Poly (Vinyl Chloride) (PVC) Pipe Culverts. Delete the first sentence of the first paragraph of Subsection 708.17.2 on page 645 and substitute the following.

Corrugated poly (vinyl chloride) (PVC) pipe shall conform to the requirements of AASHTO Designation: M 304 and shall have soil tight joints, unless otherwise specified. Non-perforated PVC pipe used in underdrains shall either be manufactured with an ultra-violet light inhibitor or be fully coated with an ultra-violet light inhibitor.

After Subsection 708.17.2 on page 645, add the following:

907-708.17.2.1--Inspection and Final Acceptance of Poly (Vinyl Chloride) (PVC) Pipe Culverts. Approximately 50% of the installed length of PVC pipe shall be inspected for excess deflection no sooner than 30 days after the embankment material over the pipe is placed to the required subgrade elevation or the maximum required fill height. The inspection shall be performed using either electronic deflectometers, calibrated television or video cameras, or a "go, no-go" mandrel that has an effective diameter of 95% of the nominal inside diameter of the pipe.

Pipe found to have deflection values greater than 5% shall be removed and replaced at no cost to the State.

907-708.18--Sewer Pipe Used for Underdrains.

907-708.18.1--General. After the second paragraph of Subsection 708.18.1 on page 645 add the following:

In lieu of the pipe listed in this subsection, pipe meeting the requirements of Subsection 708.19 may also be used for plastic underdrain pipe.

907-708.18.3--Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe. After the first sentence of Subsection 708.18.3 on page 645, add the following.

Non-perforated PVC pipe shall either be manufactured with an ultra-violet light inhibitor or be fully coated with an ultra-violet light inhibitor.

907-708.18.4--Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe. Delete the paragraph in Subsection 708.18.4 on page 645 and substitute the following.

This pipe shall conform to the following requirements. For pipe sizes less than or equal to six inches (≤ 6"), the pipe shall be Class PS46 meeting the requirements of AASHTO Designation: M 278. For pipe sizes greater than six inches (> 6"), the pipe shall meet the requirements of AASHTO Designation: M 304. Non-perforated PVC pipe shall either be manufactured with an ultra-violet light inhibitor or be fully coated with an ultra-violet light inhibitor.

Delete Subsection 708.19 on page 645 and substitute the following:

907-708.19--Corrugated Polyethylene Pipe. This pipe shall be high density polyethylene pipe or drainage tubing meet the requirements of AASHTO Designation: M 294, Type S or SP, or

AASHTO Designation: M 252, Type S or Type SP, as applicable.

907-708.22.2--Exceptions to AASHTO. Delete the sixth paragraph of Subsection 708.22.2 on page 647.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-709-1 **CODE: (SP)**

DATE: 05/05/2008

SUBJECT: Metal Pipe

Section 709, Metal Pipe, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

After Subsection 709.02 on page 649, add the following:

907-709.02.1--Aluminized Corrugated Metal Culvert Pipe and Pipe Arches. All aluminized metal pipe and arches shall be manufactured from Type 2 corrugated metal pipe and arches in accordance with the requirements of Subsection 709.02.

907-709.03--Bituminous Coated Corrugated Metal pipe and Pipe Arches.

907-709.03.1--Materials. Delete the first sentence of the first paragraph of Subsection 709.03.1 on page 649, and substitute the following:

Bituminous coated corrugated metal pipe and arches shall conform to the requirements of AASHTO Designation: M 190 and be completely coated inside and out with an asphalt cement which will meet the performance requirements hereinafter set forth.

907-709.05--Polymer Coated Corrugated Metal Pipe and Pipe Arches. Delete the first sentence of the first paragraph of Subsection 709.05 on pages 649 and 650, and substitute the following:

Polymer coated corrugated metal pipe and arches shall conform to the requirements of AASHTO Designation: M 245, except the minimum gauge thickness shall be as shown on the plans or in the contract; however, corrugated metal pipe manufactured from sheets thicker than that specified will be acceptable when approved by the Engineer. The internal diameter of corrugated metal pipe will be determined by inside measurement between the crests of the corrugations. Corrugations greater than 3" x 1" will not be allowed in arch pipe.

907-709.06--Corrugated Metal Pipe for Underdrains. Delete the sentence in Subsection 709.06 on page 650, and substitute the following:

Corrugated metal pipe shall conform to AASHTO Designation: M 36, Type III. Type I pipe which has been perforated to permit the in-flow or out-flow of water may be used in lieu of Type III pipe.

907-709.06.1--Aluminized Corrugated Metal Culvert Pipe For Underdrains. All aluminized corrugated metal pipe for underdrains shall be manufactured from Type 2 corrugated metal pipe

and arches in accordance with the requirements of AASHTO Designation: M 36, Type III. Manufacturer must repair any damaged coating caused from perforating the pipe.

907-709.07--Bituminous Coated Corrugated Metal Pipe for Underdrains. Delete the sentence in Subsection 709.07 on page 650, and substitute the following:

Bituminous coated corrugated metal pipe shall conform to the requirements of AASHTO Designation: M 190, Type A with a bituminous coating applied in accordance with the requirements of Subsection 709.03. Manufacturer must repair any damaged coating caused from perforating the pipe.

907-709.08--Polymer Coated Corrugated Metal Pipe for Underdrains. Delete the sentence in Subsection 709.08 on page 650, and substitute the following:

The metal pipe for underdrains shall conform to the requirements of AASHTO Designation: M 245, Type III and the polymer coating shall conform to the requirements of Subsection 709.05. Type I pipe which has been perforated to permit the in-flow or out-flow of water may be used in lieu of Type III pipe. Manufacturer must repair any damaged coating caused from perforating the pipe.

907-709.09--Corrugated Aluminum Alloy Culvert Pipe and Arches. Delete the first sentence in Subsection 709.09 on page 650, and substitute the following:

Corrugated aluminum culvert pipe and arches shall conform to the requirements of AASHTO Designation: M l96, Type IA.

907-709.10--Corrugated Aluminum Alloy Pipe for Underdrains. Delete the first sentence in Subsection 709.10 on page 650, and substitute the following:

Corrugated aluminum pipe underdrains shall conform to the requirements of AASHTO Designation: M 196, Type III. Type I pipe which has been perforated to permit the in-flow or out-flow of water may be used in lieu of Type III pipe.

907-709.11--Bituminous Coated Corrugated Aluminum Alloy Culvert Pipe and Arches. Delete the sentence in Subsection 709.11 on page 650, and substitute the following:

Bituminous coated aluminum culvert pipe and arches shall conform to AASHTO Designation: M 196, Type IA, and in addition shall be coated inside and out as specified in Subsection 709.03. Manufacturer must repair any damaged coating caused from perforating the pipe.

907-709.13--Bituminous Coated Corrugated Aluminum Alloy Pipe for Underdrains. Delete the sentence in Subsection 709.13 on page 650, and substitute the following:

This pipe shall conform to AASHTO Designation: M 196, Type III, and shall be coated with bituminous material conforming to AASHTO Designation: M 190, type coating as specified. Manufacturer must repair any damaged coating caused from perforating the pipe.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-710-1 **CODE: (SP)**

DATE: 06/24/10

SUBJECT: Fast Dry Solvent Traffic Paint

Section 710, Paint, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is amended as follows:

After Subsection 710.05 on Page 661, add the following:

907-710.06—Fast Dry Solvent Traffic Paint. Fast dry solvent traffic paints intended for use under this specification shall include products that are single packaged and ready mixed. Upon curing, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall have the option of formulating the material according to their own specifications. However, the requirements delineated in this specification, Section 619 and Section 710 shall apply regardless of the formulation used. The material shall be free from all skins, dirt and foreign objects.

907-710.06.1—Composition.

907-710.06.1.1—Percent Pigment. The percent pigment by weight shall be not less than 51% nor more than 58% when tested in accordance with ASTM D 3723.

907-710.06.1.2—Viscosity. The consistency of the paint shall be not less than 75 nor more than 95 Krebs Units (KU) when tested in accordance with ASTM D 562.

907-710.06.1.3—Weight per Gallon. The paint shall weigh a minimum 11.8 pounds per gallon and the weight of the production batches shall not vary more than +/- 0.5 pounds per gallon from the weight of the qualification samples when tested in accordance with ASTM D 1475.

907-710.06.1.4—Total Solids. The percent of total solids shall not be less than 70% by weight when tested in accordance with ASTM D 2369.

907-710.06.1.5—Dry Time (No pick-up). The paint shall dry to a no tracking condition in a maximum of 10 minutes.

907-710.06.1.6—Volatile Organic Content. The volatile organic content (VOC) shall contain a maximum of 1.25 pounds of volatile organic matter per gallon of total non-volatile paint material when tested in accordance with ASTM D 3960.

907-710.06.1.7—Bleeding. The paint shall have a minimum bleeding ratio of 0.95 when tested in accordance with Federal Specification TT-P-115D.

907-710.06.1.8—Color. The initial daytime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Daytime Chromaticity Coordinates (Corner Points)

	1	2	3	4
x	0.53	0.51	0.455	0.472
y	0.456	0.485	0.444	0.4

The initial daytime chromaticity of white materials shall fall within the box created by the following coordinates:

Daytime Chromaticity Coordinates (Corner Points)

	1	2	3	4
x	0.355	0.305	0.285	0.355
y	0.355	0.305	0.325	0.375

907-710.06.2—Environmental Requirements. All yellow materials using lead chromate pigments shall meet the criteria of non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Test Method 1311, Toxicity Characteristics Leaching Procedures (TCLP). The striping and marking material , upon preparation and installation, shall not exude fumes which are toxic, or detrimental to persons or property. All material using lead free pigments shall NOT contain either lead or other Resource Conservation and Recovery Act (RCCA) materials in excess of the standard defined by EPA Method 3050 and 6010.

907-710.06.3—Acceptance Procedures. Acceptance of all fast dry solvent based traffics paint will be based on the Manufacturer's Certification and Certified Test Results. The Contractor shall furnish the Engineer with three copies of the manufacturer's certification stating that each lot of material in a shipment complies with the requirements of this contract. In addition, the Contractor shall provide Certified Test Reports for all tests required by this specification. The test results shall be representative of the material contained with the shipment.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-711-4 **CODE: (IS)**

DATE: 06/26/2009

SUBJECT: Synthetic Structural Fiber Reinforcement

Section 711, Reinforcement and Wire Rope, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

After Subsection 711.03.4.3 on page 665, add the following:

907-711.04--Synthetic Structural Fiber. The synthetic structural fibers shall be approved for listing in the Department's "Approved Sources of Materials" prior to use. The synthetic structural fibers shall be added to the concrete and mixed in accordance with the manufacturer's recommended methods.

907-711.04.1--Material Properties. The fibers shall meet the requirements of ASTM Designation: C 1116, Section 4.1.3. The fibers shall be made of polypropylene, polypropylene/polyethylene blend, nylon, or polyvinyl alcohol (PVA).

907-711.04.2--Minimum Dosage Rate. The dosage rate shall be such that the average residual strength ratio ($R_{150,3.0}$) of fiber reinforced concrete beams is a minimum of 20.0 percent when the beams are tested in accordance with ASTM Designation: C 1609. The dosage rate for fibers shall be determined by the following.

The fiber manufacturer shall have the fibers tested by an acceptable, independent laboratory acceptable to the Department and regularly inspected by the Cement and Concrete Reference Laboratory of the National Institutes of Standards and Technology and approved to perform ASTM Designations: C 39, C 78, and C192.

The laboratory shall test the fibers following the requirements of ASTM Designation: C 1609 in a minimum of three (3) test specimens cast from the same batch of concrete, molded in 6 x 6 x 20-inch standard beam molds meeting the requirements of ASTM Designation: C 31. The beams shall be tested on an 18-inch span. The tests for $R_{150,3.0}$ shall be performed when the average compressive strength of concrete used to cast the beams is between 3500 and 4500 psi. The tests for compressive strength shall follow the requirements of ASTM Designation: C 39. The average compressive strength shall be determined from a minimum of two (2) compressive strength cylinders.

The value for $R_{150,3}$ shall be determined using the following equation:

$$R_{150,3.0} = \frac{f_{150,3.0}}{f_1} \times 100$$

The residual flexural strength ($f_{150,3.0}$) shall be determined using the following equation:

$$f_{150,3.0} = \frac{P_{150,3.0} \times L}{b \times d^2}$$

where:

$f_{150,3.0}$ is the residual flexural strength at the midspan deflection of $L/150$, (psi),

$P_{150,3.0}$ is the residual load capacity at the midspan deflection of $L/150$, (lbf),

L is the span, (in),

b is the width of the specimen at the fracture, (in), and

d is the depth of the specimen at the fracture, (in).

For a 6 x 6 x 20-inch beam, the $P_{150,3.0}$ shall be measured at a midspan deflection of 0.12 inch.

Additionally, $R_{150,3.0}$, $f_{150,3.0}$, and $P_{150,3.0}$ may also be referred to as R_{150}^{150}, f_{150}^{150}, and P_{150}^{150} respectively.

At the dosage rate required to achieve the minimum $R_{150,3}$, the mixture shall both be workable and the fibers shall not form clumps.

The manufacturer shall submit to the State Materials Engineer certified test reports from the independent laboratory showing the test results of each test specimen.

907-711.04.3--Job Control Requirements. The synthetic structural fibers shall be one from the Department's "Approved Sources of Materials."

At the required dosage rate, the mixture shall both be workable and the fibers shall not form clumps to the satisfaction of the Engineer. If the mixture is determined by the Engineer to not be workable or have clumps of fibers, the mixture may be rejected.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-713-2 **CODE: (IS)**

DATE: 11/09/2010

SUBJECT: Admixtures for Concrete

Section 713, Concrete Curing Materials and Admixtures, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

After the second paragraph of Subsection 713.01.2 on page 676, add the following.

Type 1-D compound may be used on bridge rails, median barriers, and other structures requiring a spray finish. When Type 1-D compound is used, it will be the Contractor's responsibility to assure that the compound has dissipated from the structure prior to applying the spray finish and that the spray finish adheres soundly to the structure.

Delete Subsection 713.02 on pages 676 & 677, and substitute the following:

907-713.02--Admixtures for Concrete. Air-entraining admixtures used in Portland cement concrete shall comply with AASHTO Designation: M 154. Set-retarding, accelerating, and/or water-reducing admixtures shall comply with AASHTO Designation: M 194. Water-reducing admixture shall meet the minimum requirements for Type A. Set-retarding admixtures shall meet the minimum requirements for Type D.

In order to obtain approval of an admixture, the State Materials Engineer shall have been furnished certified test reports, made by an acceptable independent laboratory regularly inspected by the Cement and Concrete Reference Laboratory of the National Institutes of Standards and Technology, which show that the admixture meets all the requirements of the applicable AASHTO Standard Specification.

The Department reserves the right to sample, for check tests, any shipment or lot of admixture delivered to a project.

The Department reserves the right to require tests of the material to be furnished, using the specific cement and aggregates proposed for use on the project, as suggested in AASHTO Designation: M 154 and outlined in AASHTO Designation: M 194.

After an admixture has been approved, the Contractor shall submit to the State Materials Engineer, with each new lot of material shipped, a certification from the manufacturer in accordance with the requirements of Subsection 700.05.1 and stating the material is of the same composition as originally approvedand has not been changed or altered in any way. The requirement in Subsection 700.05.1(b) is not required on the certification from the manufacturer.

Admixtures containing chlorides will not be permitted.

Failure to maintain compliance with any requirement of these specifications shall be cause for rejection of any previously approved source or brand of admixture.

Admixtures shall only be used in accordance with the manufacturer's recommended dosage range as set forth in the manufacturer's approval request correspondence. When an admixture is used in Portland cement concrete, it shall be the responsibility of the Contractor to produce satisfactory results.

907-713.02.1--Source Approval. In order to obtain approval of an admixture, the Producer/Suppliers shall submit to the State Materials Engineer the following for review: certified test reports, made by an acceptable independent laboratory regularly inspected by the Cement and Concrete Reference Laboratory of the National Institutes of Standards and Technology, which show that the admixture meets all the requirements of the applicable AASHTO or Department Specification for the specific type and the dosage range for the specific type of admixture.

907-713.02.2--Specific Requirements. Admixtures containing chlorides will not be permitted.

907-713.02.3--Acceptance. The Department reserves the right to sample, for check tests, any shipment or lot of admixture delivered to a project.

The Department reserves the right to require tests of the material to be furnished, using the specific cement and aggregates proposed for use on the project, as suggested in AASHTO Designation: M 154 and outlined in AASHTO Designation: M 194.

Failure to maintain compliance with any requirement of these specifications shall be cause for rejection of any previously approved source or brand of admixture.

With each new lot of material shipped the Contractor shall submit to the State Materials Engineer, a notarized certification from the manufacturer showing that the material complies with the requirements of the applicable AASHTO or Department Specification.

When an admixture is used, it shall be the responsibility of the Contractor to produce satisfactory results.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-714-6 **CODE: (IS)**

DATE: 11/09/2010

SUBJECT: Miscellaneous Materials

Section 714, Miscellaneous Materials, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-714.05--Fly Ash. Delete Subsections 714.05.1 & 714.05.2 on pages 680 & 681, and substitute the following:

907-714.05.1--General. The fly ash source must be approved for listing in the Department's "Approved Sources of Materials" prior to use. The acceptance of fly ash shall be based on certified test reports, certification of shipment from the supplier, and tests performed on samples obtained after delivery in accordance with the Department's Materials Division Inspection, Testing, and Certification Manual and Department SOP.

Different classes of fly ash or different sources of the same class shall not be mixed or used in the construction of a structure or unit of a structure without written permission from the Engineer.

The Contractor shall provide suitable means for storing and protecting the fly ash from dampness. Separate storage silos, bins, or containers shall be provided for fly ash. Fly ash which has become partially set or contains lumps of caked fly ash shall not be used.

The temperature of the bulk fly ash shall not be greater than 165°F at the time of incorporation into the work.

All classes of fly ash shall meet the supplementary option chemical requirement for available alkalies listed in AASHTO Designation: M 295, Table 2. Class F fly ash shall have a calcium oxide (CaO) content of less than 6.0%. Class C fly ash shall have a CaO content of greater than or equal to 6.0%.

The replacement of Portland cement with fly ash shall be in accordance with the applicable replacement content specified in Subsection 907-701.02.2.

In addition to these requirements, fly ash shall meet the following specific requirements for the intended use.

907-714.05.2--Fly Ash for Use in Concrete. When used with Portland cement in the production of concrete or grout, the fly ash shall meet the requirements of AASHTO Designation: M 295, Class C or F, with the following exception:

The loss on ignition shall not exceed 6.0 percent.

No additional cementitious materials, such as blended hydraulic cement, GGBFS, metakaolin, or others, shall be added to or as a replacement for Portland cement when used with fly ash.

907-714.06--Ground Granulated Blast Furnace Slag (GGBFS). Delete Subsection 714.06.1 on page 681, and substitute the following:

907-714.06.1--General. The GGBFS source must be approved for listing in the Department's "Approved Sources of Materials" prior to use. The acceptance of GGBFS shall be based on certified test reports, certification of shipment from the supplier, and tests performed on samples obtained after delivery in accordance with the Department's Materials Division Inspection, Testing, and Certification Manual and Department SOP.

The Contractor shall provide suitable means for storing and protecting the GGBFS against dampness and contamination. Separate storage silos, bins, or containers shall be provided for GGBFS. GGBFS which has become partially set, caked or contains lumps shall not be used.

The State Materials Engineer shall be notified in writing of the nature, amount and identity of any processing or other additions made to the GGBFS during production.

GGBFS from different mills shall not be mixed or used alternately in any one class of construction or structure without written permission from the Engineer; except that this requirement will not be applicable to cement treatment of design soils or bases.

No additional cementitious materials, such as blended hydraulic cement, fly ash, metakaolin, or others, shall be added to or as a replacement for Portland cement when used with GGBFS in the production of concrete. The replacement of Portland cement with GGBFS shall be in accordance with the applicable replacement content specified in Subsection 907-701.02.2.

Delete Subsection 714.07 on page 682, and substitute the following:

907-714.07--Additional Cementitious Materials.

907-714.07.1--Metakaolin.

907-714.07.1.1--General. Metakaolin shall only be used as a supplementary cementitious material in Portland cement concrete for compliance with the requirements for cementitious materials exposed to soluble sulfate conditions. Metakaolin from different sources shall not be mixed or used alternately in any one class of construction or structure without written permission from the Engineer. No additional cementitious materials, such as blended hydraulic cement, fly ash, GGBFS, or others, shall be added to or as a replacement for Portland cement when used with metakaolin in the production of concrete.

The State Materials Engineer shall be notified in writing of the nature, amount and identity of any processing, or other additions made to the metakaolin during production.

907-714.07.1.2--Source Approval. The approval of each metakaolin source shall be on a case by case basis as determined by the State Materials Engineer. In order to obtain approval of a metakaolin source, the Producer/Suppliers shall submit to the State Materials Engineer the

following for review: certified test reports, made by an acceptable, independent laboratory regularly inspected by the Cement and Concrete Reference Laboratory of the National Institutes of Standards and Technology, which show that the metakaolin meets all the requirements of AASHTO Designation: M295, including the Effectiveness in contributing to sulfate resistance, Procedure A, listed in AASHTO Designation: M295, Table 4 for Supplementary Optional Physical Requirements, and other requirements listed herein.

In order to demonstrate effectiveness in contributing to sulfate resistance, included in this test data shall be results of metakaolin from the proposed source tested in accordance with ASTM Designation: C 1012. There shall be two sets of test specimens per the following:

a. One set of test specimens shall be prepared using a Type I Portland cement meeting the requirements of AASHTO Designation: M85 and having a tricalcium aluminate (C_3A) content of more than 8.0%,

b. One set of test specimens shall be prepared using a Type II Portland cement meeting the requirements of AASHTO Designation: M85.

c. The proposed metakaolin shall be incorporated at the rate of 10% cement replacement in each set of test specimens and shall meet both of the acceptance criteria listed below for source approval.

The requirement for acceptance of the test sample using Type I Portland cement is an expansion of 0.10% or less at the end of six months. The requirement for acceptance of the test sample using Type II Portland cement is an expansion of 0.05% or less at the end of six months.

907-714.07.1.3--Storage. The Contractor shall provide suitable means for storing and protecting the metakaolin against dampness and contamination. Metakaolin which has become partially set, caked, or contains lumps shall not be used.

907-714.07.1.4--Specific Requirements. Metakaolin shall meet the requirements of AASHTO Designation: M 295, Class N with the following modifications:

1. The sum of $SiO_2 + Al_2O_3 + Fe_2O_3$ shall be at least 85%. The Material Safety Data Sheet shall indicate that the amount of crystalline silica, as measured by National Institute of Occupation Safety and Health (NIOSH) 7500 method, after removal of the mica interference, is less than 1.0%.
2. The loss on ignition shall be less than 3.0%.
3. The available alkalies, as equivalent Na_2O, shall not exceed 1.0%.
4. The amount of material retained on a No. 325 mesh sieve shall not exceed 1.0%.
5. The strength activity index at seven (7) days shall be at least 85%.

907-714.07.1.5--Acceptance. With each new lot of material shipped the Contractor shall submit to the State Materials Engineer a certified test report from the manufacturer showing that the material meets the requirements AASHTO Designation: M295, Class N and the requirements of this Subsection.

The Department reserves the right to sample, for check tests, any shipment or lot of metakaolin delivered to a project.

907-714.07.2--Silica Fume.

907-714.07.2.1--General. Silica fume shall only be used as a supplementary cementitious material in Portland cement concrete for compliance with the requirements for cementitious materials exposed to soluble sulfate conditions. Silica fume from different sources shall not be mixed or used alternately in any one class of construction or structure without written permission from the Engineer. No additional cementitious materials, such as blended hydraulic cement, performance hydraulic cement, fly ash, GGBFS, or others, shall be added to or as a replacement for Portland cement when used with silica fume in the production of concrete.

The State Materials Engineer shall be notified in writing of the nature, amount and identity of any processing, or other additions made to the silica fume during production.

907-714.07.2.2--Source Approval. The approval of each silica fume source shall be on a case by case basis as determined by the State Materials Engineer. In order to obtain approval of a silica fume source, the Producer/Suppliers shall submit to the State Materials Engineer the following for review: certified test reports, made by an acceptable, independent laboratory regularly inspected by the Cement and Concrete Reference Laboratory of the National Institutes of Standards and Technology, which show that the silica fume meets all the requirements of AASHTO Designation: M307, Table 3, including the Sulfate resistance expansion, listed in the table for Optional Physical Requirements, and other requirements listed herein.

In order to demonstrate effectiveness in contributing to sulfate resistance, included in this test data shall be results of silica fume from the proposed source tested in accordance with ASTM Designation: C 1012. There shall be two sets of test specimens per the following:

a. One set of test specimens shall be prepared using a Type I Portland cement meeting the requirements of AASHTO Designation: M85 and having a tricalcium aluminate (C_3A) content of more than 8.0%,

b. One set of test specimens shall be prepared using a Type II Portland cement meeting the requirements of AASHTO Designation: M85.

c. The proposed silica fume shall be incorporated at the rate of 8% cement replacement in each set of test specimens and shall meet both of the acceptance criteria listed below for source approval.

The requirement for acceptance of the test sample using Type I Portland cement is an expansion of 0.10% or less at the end of six months. The requirement for acceptance of the test sample using Type II Portland cement is an expansion of 0.05% or less at the end of six months.

907-714.07.2.3--Storage. The Contractor shall provide suitable means for storing and protecting the silica fume against dampness and contamination. Silica fume which has become partially set, caked, or contains lumps shall not be used.

907-714.07.2.4--Acceptance. With each new lot of material shipped, the Contractor shall submit to the State Materials Engineer a certified test report from the manufacturer showing that the material meets the Chemical and Physical Requirements of AASHTO Designation: M307.

The Department reserves the right to sample, for check tests, any shipment or lot of silica fume

delivered to a project.

Delete Subsection 714.11.6 on pages 690 and 691, and substitute the following:

907-714.11.6--Rapid Setting Cementitious Patching Compounds for Concrete Repair. Rapid setting concrete patching compounds must be approved for listing in the Department's "Approved Sources of Materials" prior to use. Upon approval, a product must be recertified every four (4) years to remain on the "Approved Sources of Materials" list. Each product shall be pre-measured and packaged dry by the manufacturer. All liquid solutions included by the manufacturer as components of the packaged material shall be packaged in a watertight container. The manufacturer may include aggregates in the packaged material or recommend the addition of Contractor furnished aggregates.

The type, size and quantity of aggregates, if any, to be added at the job site shall be in accordance with the manufacturer's recommendations and shall meet the requirements of Subsection 703.02 for fine aggregate and Subsection 703.03 for coarse aggregate. Required mixing water to be added at the job site shall meet the requirements of Subsection 714.01.2.

Only those bonding agents, if any, recommended by the manufacturer of the grout or patching compounds may be used for increasing the bond to old concrete or mortar surfaces.

Patching compounds containing soluble chlorides will not be permitted when in contact with steel.

Site preparation, proportioning of materials, mixing, placing and curing shall be performed in accordance with the manufacturer's recommendation for the specific type of application, and the Contractor shall furnish a copy of these recommendations to the Engineer.

Rapid setting cementitious concrete patching compounds, including components to be added at the job site, shall conform to the following physical requirements:

Non-shrink cementitious grouts shall not be permitted for use.

Compressive strength shall equal or exceed 3000 psi in 24 hours in accordance with ASTM C 928 for Type R2 concrete or mortar.

Bond strength shall equal or exceed 1000 psi in 24 hours in accordance with ASTM C 928 for Type R2 concrete or mortar.

The material shall have a maximum length change of ±0.15% in accordance with ASTM C 928 for Type R2 concrete or mortar.

The Contractor shall furnish to the Engineer three copies of the manufacturer's certified test report(s) showing results of all required tests and certification that the material meets the specifications when mixed and place in accordance with the manufacturer's instructions. When the mixture is to be placed in contact with steel, the certification shall further state that the packaged material contains no chlorides. Certified test report(s) and certification shall be furnished for each lot in a shipment.

The proportioning of materials must be approved by the State Materials Engineer and any subsequent change in proportioning must also be approved. A sample of each component shall be submitted to the Engineer along with the quantity or percentage of each to be blended. At least 45 days must be allowed for initial approval.

The proportioning of materials for subsequent lots may be approved by the State Materials Engineer upon receipt of certification from the manufacturer that the new lot of material is the same composition as that originally approved by the Department and that the material has not been changed or altered in any way.

907-714.11.7--Commercial Grout for Anchoring Doweled Tie Bars in Concrete. Before Subsection 714.11.7.1 on page 691, add the following:

Approved Non-"Fast Set" Epoxy anchor systems as specified below may be used for the repair of concrete pavements that do not involve permanent sustained tension applications or overhead applications.

"***Fast Set Epoxy***" may not be used for any Adhesive Anchor Applications. Adhesive Anchor Systems (Fast Set epoxy or otherwise) shall not be used for permanent sustained tension applications or overhead applications. "Fast Set Epoxy" refers to an epoxy produced by the Sika Corporation called Sikadur AnchorFix-3 and repackaged for sale under a variety of names/companies listed at the Federal Highway Administration web site at the following link:

http://www.fhwa.dot.gov/Bridge/adhesives.cfm

907-714.11.7.4--Acceptance Procedure. After the last sentence of the first paragraph of Subsection 714.11.4 on page 691, add the following:

Upon approval, a product must be recertified every four (4) years to remain on the "Approved Sources of Materials" list.

907-714.11.8--Epoxy Joint Repair System.

907-714.11.8.1--General. After the last sentence of the first paragraph of Subsection 714.11.8.1 on page 692, add the following:

Upon approval, a product must be recertified every four (4) years to remain on the "Approved Sources of Materials" list.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-804-13 **CODE: (IS)**

DATE: **11/09/2010**

SUBJECT: **Concrete Bridges And Structures**

Section 804, Concrete Bridges And Structures, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows:

907-804.02-- Materials.

907-804.02.1--General. Delete the third and fourth sentences of the first paragraph of Subsection 804.02.1 on page 846, and substitute the following:

For projects with 1000 cubic yards and more, quality control and acceptance shall be achieved through statistical evaluation of test results. For projects of more than 200 but less than 1000 cubic yards, quality control and acceptance shall be achieved by individual test results.

Add the following materials to the list of materials in Subsection 804.02.1 on page 847.

Blended Cement ..... 907-701.01 and 907-701.04
Ground Granulated Blast Furnace Slag (GGBFS) 907-714.06
Silica Fume 907-714.07.2

907-804.02.8--Laboratory Accreditation. In Table 1 of Subsection 804.02.8 on page 849, substitute AASHTO: R 39 - Making and Curing Concrete Test Specimens in the Laboratory for AASHTO: T 126 - Making and Curing Concrete Test Specimens in the Laboratory.

907-804.02.9--Testing Personnel. Delete Table 2 in this subsection and replace it with the following.

Table 2

Concrete Technician's Tasks	Test Method Required	Certification Required**
Sampling or Testing of Plastic Concrete	AASHTO Designation:T 23, T 119, T 121, T 141, T 152, T 196, and ASTM Designation: C 1064	MDOT Class I certification
Compressive Strength Testing of Concrete Cylinders	AASHTO Designation: T 22 and T 231	MDOT Concrete Strength Testing Technician certification
Sampling of Aggregates	AASHTO Designation: T 2	Work under the supervision of an MDOT Class II certified technician

Testing of Aggregates	AASHTO Designation: T 19, T 27, T 84, T 85, T 248, and T 255	MDOT Class II certification
Proportioning of Concrete Mixtures*	AASHTO Designation: M 157 and R 39	MDOT Class III
Interpretation and Application of Maturity Meter Readings	AASHTO Designation: T 325 and ASTM Designation: C 1074	MDOT Class III or Two hours maturity method training

* Technicians making concrete test specimens for meeting the requirements of Subsection 804.02.10.1.2 shall be MDOT Class I certified and under the direct supervision of an MDOT Class III certified technician.

** MDOT Class I certification encompasses the same test procedures and specifications as ACI Concrete Field Testing Technician Grade I. MDOT Class II certification encompasses the same test procedures and specifications as ACI Aggregate Testing Technician - Level 1. MDOT Concrete Strength Testing Technician encompasses the same test procedures and specifications as ACI Concrete Strength Testing certification.

For specifics about the requirements for each level of certification, please refer to the latest edition of the Department's *Concrete Field Manual*. Technicians holding current MDOT Class I, MDOT Class II and/or MDOT Class III certifications shall be acceptable until those certifications expire. Upon a current certification expiration, recertification with the certifications listed in Table 2 shall be required. Technicians currently performing either specific gravity testing of aggregates or compressive strength tests shall be required to either:

- have the required MDOT certification listed in Table 2, or
- have a current MDOT Class III certification or work under the direct supervision of current MDOT Class III technician, and have demonstrated the specific gravity and/or compressive strength test during the inspection of laboratory equipment by the Materials Division, Concrete Section.

907-804.02.10--Portland Cement Concrete Mix Design. Delete the first sentence of the first paragraph of Subsection 804.02.10 on page 850 and substitute the following:

At least 30 days prior to production of concrete, the Contractor shall submit to the Engineer proposed concrete mixture designs complying with the Department's *Concrete Field Manual*.

Delete the Notes under Table 3 of Subsection 804.02.10 on pages 850 & 851, and substitute the following:

* Maximum size aggregate shall conform to the concrete mix design for the specified aggregate.

** The replacement limits of Portland cement by weight by other cementitious materials (such as fly ash, GGBFS, metakaolin, silica fume, or others) shall be in accordance with the values in Subsection 907-701.02. Other hydraulic cements may be used in accordance with the specifications listed in Section 701.

*** The slump may be increased up to eight (8) inches with :

- an approved water-reducing admixture,
- an approved water-reducing/set-retarding admixture, or
- a combination of an approved water-reducing admixture and an approved set-retarding admixture, in accordance with 907-713.02. Minus slump requirements shall meet those set forth in Table 3 of AASHTO Designation: M157.

**** Entrained air is not required except for concrete exposed to seawater. For concrete exposed to seawater, the total air content shall be 3.0 % to 6.0%. For concrete not exposed to seawater, the total air content shall not exceed 6.0%.

***** Class DS Concrete for drilled shafts shall have an 8±1-inch slump.

Delete the last paragraph of Subsection 804.02.10 on page 851 and substitute the following:

At least one water-reducing admixture shall be used in all classes of concrete in accordance with the manufacturer's recommended dosage range. Any combinations of admixtures shall be approved by the Engineer before their use.

907-804.02.10.1.1--Proportioning on the Basis of Previous Field Experience of Trial Mixtures. Delete the first sentence of the first paragraph of Subsection 804.02.10.1.1 on page 851, and substitute the following:

Where a concrete production facility has a record, based on at least 10 consecutive strength tests from at least 10 different batches within the past 12 months from a mixture not previously used on Department projects, the standard deviation shall be calculated.

907-804.02.10.3--Field Verification of Concrete Mix Design. Delete the first sentence of the third paragraph of Subsection 804.02.10.3 on page 853 and substitute the following:

For all Classes of concrete, the mixture shall be verified to yield within 2.0% of the correct volume when all the mix water is added to the batch.

For all Classes of concrete other than DS, F, and FX, the mixture shall produce a slump within a minus 1½-inch tolerance of the maximum permitted for mixtures with a maximum permitted slump of three inches (3") or less or within a minus 2½-inch tolerance of the maximum permitted for mixtures with a maximum permitted slump of greater than three inches (3"), and producing a total air content within a minus 1½ percent tolerance of the maximum allowable air content in Table 3.

For Class DS, the slump shall be within the requirements in Note ***** below Table 3. For Class DS exposed to seawater, the total air content shall be within a minus 1½ percent tolerance of the maximum allowable air content in Note **** below Table 3. For Class DS not exposed to seawater the total air content shall be within the requirements in Note **** below Table 3.

For Classes F and FX, the slump shall be within a minus 1½-inch tolerance of the maximum permitted for mixtures with a maximum permitted slump of three inches (3") or less or within a minus 2½-inch tolerance of the maximum permitted for mixtures with a maximum permitted

slump of greater than three inches (3"). For Classes F and FX exposed to seawater, the total air content shall be within a minus 1½ percent tolerance of the maximum allowable air content in Note **** below Table 3. For Classes F and FX not exposed to seawater the total air content shall be within the requirements in Note **** below Table 3.

Delete the third sentence of the third paragraph of Subsection 804.02.10.3 on page 853, and substitute the following:

If the requirements of yield, slump, or total air content are not met within three (3) production days after the first placement, subsequent field verification testing shall not be permitted on department projects, and the mix design shall not be used until the requirements listed above are met

907-804.02.10.4--Adjustments of Mixture Proportions. Delete the paragraph in Subsection 804.02.10.4 on page 854, and substitute the following:

The mixture may be adjusted by the Class III Certified Technician representing the Contractor in accordance with the allowable revisions listed in the Department's Concrete Field Manual, paragraph 5.7. Written notification shall be submitted to the Engineer a minimum of seven (7) days prior to any source or brand of material change, aggregate size change, allowable material type change, or decrease in any cementitious material content. Any adjustments of the concrete mixture design shall necessitate repeat of field verification procedure as described in Subsection 804.02.10.3 and approval by the Engineer.

907-804.02.11--Concrete Batch Plants. Delete the first three paragraphs of Subsection 804.02.11 on page 854, and substitute the following:

The concrete batch plant shall meet the requirements of the National Ready Mixed Concrete Association *Quality Control Manual, Section 3, Plant Certification Checklist* as outlined in the latest edition of the Department's *Concrete Field Manual*. The Contractor shall submit a copy of the approved checklist along with proof of calibration of batching equipment, i.e., scales, water meter, and admixture dispenser, to the Engineer 30 days prior to the production of concrete.

For projects with 1000 cubic yards and more, the concrete batch plant shall meet the requirements for an automatic system capable of recording batch weights. It shall also have automatic moisture compensation for the fine aggregate. For projects of more than 200 but less than 1000 cubic yards the plant can be equipped for manual batching with a fine aggregate moisture meter visible to the plant operator.

The concrete batch plant shall have available adequate facilities to cool concrete during hot weather.

Mixer trucks to be used on the project are to be listed in the checklist and shall meet the requirements of the checklist.

907-804.02.12--Contractor's Quality Control. Delete the fourth paragraph of Subsection 804.02.12 on page 854 & 855, and substitute the following:

The Contractor's Quality Control program shall encompass the requirements of AASHTO Designation: M 157 into concrete production and control, equipment requirements, testing, and batch ticket information. The requirement of AASHTO Designation: M 157, Section 11.7 shall be followed except, on arrival to the job site, a maximum of 1½ gallons per cubic yard is allowed to be added. Water shall not be added at a later time. If the maximum permitted slump is exceeded after the addition of water at the job site, the concrete shall be rejected.

907-804.02.12.3--Documentation. After the second sentence of the second paragraph of Subsection 804.02.12.3 on page 856, add the following:

Batch tickets and gradation data shall be documented in accordance with Department requirements. Batch tickets shall contain all the information in AASHTO Designation: M157, Section 16 including the additional information in Subsection 16.2 with the following exception: the information listed in paragraphs 16.2.7 and 16.2.8 is not required. Batch tickets shall also contain the concrete producer's permanent unique mix number assigned to the concrete mix design.

907-804.02.12.5--Non-Conforming Materials. In Table 4 of Subsection 804.02.12.5 on page 857, delete "/ FM" from the requirements on line B.3.a.

In Table 4 of Subsection 804.02.12.5 on page 857, replace "One set (two cylinders) for 0-100 yd^3 inclusive" with "A minimum of one set (two cylinders) for each 100 yd^3,"

907-804.02.13--Quality Assurance Sampling and Testing. Delete subparagraph c) in Subsection 804.02.13 on page 858 and substitute the following:

c) For concrete, the Contractor's QC and Department's QA testing of concrete compressive strengths compare when using the data comparison computer program with an alpha value of 0.01 for projects with 1000 cubic yards and more; or, strength comparisons are within 990 psi for projects of more than 200 but less than 1000 cubic yards.

In Table 5 of Subsection 804.02.13 on page 858, delete "and FM" from the requirements on line A.3.

Delete Subsection 907-804.02.13.1 beginning on page 859 and substitute the following:

907-804.02.13.1--Basis of Acceptance.

907-804.02.13.1.1--Sampling. Sampling of concrete mixture shall be performed in accordance with the latest edition of the Department's *Concrete Field Manual*.

907-804.02.13.1.2--Slump. Slump of plastic concrete shall meet the requirements of Table 3: MASTER PROPORTION TABLE FOR STRUCTURAL CONCRETE DESIGN. A check test shall be made on another portion of the sample before rejection of any load.

907-804.02.13.1.3--Air. Total air content of concrete shall be within the specified range for the class of concrete listed in Table 3: MASTER PROPORTION TABLE FOR STRUCTURAL CONCRETE DESIGN. A check test shall be made on another portion of the sample before rejection of any load.

907-804.02.13.1.4--Yield. If the yield of the concrete mix design is more than plus or minus 3% of the designed volume, the mix shall be adjusted by a Class III Certified Technician representing the Contractor to yield the correct volume plus or minus three percent (±3%). If batching of the proportions of the mix design varies outside the batching tolerance range of the originally approved proportions by more than the tolerances allowed in Subsection 804.02.12.1, the new proportions shall be field verified per Subsection 804.02.10.3.

907-804.02.13.1.5--Temperature. Cold weather concreting shall follow the requirements of Subsection 907-804.03.16.1. Hot weather concreting shall follow the requirements of Subsection 804.03.16.2 with a maximum temperature of 95°F for Class DS concrete or for concrete mixes containing cementitious materials meeting the requirements of Subsection 907-701.02.2 as a replacement of Portland cement. For other concrete mixes, the maximum concrete temperature shall be 90°F. Concrete with a temperature more than the maximum allowable temperature shall be rejected and not used in Department work.

907-804.02.13.1.6--Compressive Strength. Laboratory cured concrete compressive strength tests shall conform to the specified strength (f'_c) listed in the specifications. Concrete represented by compressive strength test below the specified strength (f'_c) may be removed and replaced by the Contractor. If the Contractor elects not to remove the material, it will be evaluated by the Department as to the adequacy for the use intended. All concrete evaluated as unsatisfactory for the intended use shall be removed and replaced by the Contractor at no additional cost to the Department. For concrete allowed to remain in place, reduction in payment will be as follows:

Projects with 1000 Cubic Yards and More. When the evaluation indicates that the work may remain in place, a statistical analysis will be made of the QC and QA concrete test results. If this statistical analysis indicates at least 93% of the material would be expected to have a compressive strength equal to or greater than the specified strength (f'_c) and 99.87% of the material would be expected to have a compressive strength at least one standard deviation above the allowable design stress (f_c), the work will be accepted. If the statistical analysis indicates that either of the two criteria are not met, the Engineer will provide for an adjustment in pay as follows for the material represented by the test result.

Total Pay on Material in Question = Unit Price - (Unit Price x % Reduction)

$$\% \text{ Reduction} = \frac{(f'_c - X)}{f'_c - (f_c + s)} \times 100$$

where:

f'_c = Specified 28-day compressive strength, psi

X = Individual compressive strength below f'_c, psi
s = standard deviation, psi*
f_c = allowable design stress, psi

* Standard deviation used in the above reduction of pay formula shall be calculated from the applicable preceding compressive strengths test results plus the individual compressive strength below f'_c. If below f'_c strengths occur during the project's first ten compressive strength tests, the standard deviation shall be calculated from the first ten compressive strength tests results.

Projects of More Than 200 but Less Than 1000 Cubic Yards. When the evaluation indicates that the work may remain in place, a percent reduction in pay will be assessed based on a comparison of the deficient 28-day test result to the specified strength. The Engineer will provide for an adjustment in pay as follows for the material represented by the test result.

Total Pay on Material in Question = Unit Price - (Unit Price x % Reduction)

$$\% \text{ Reduction} = \frac{(f'_c - X)}{f'_c} \times 100$$

where:

f'_c = Specified 28-day compressive strength, psi
X = Individual compressive strength below f'_c, psi

907-804.03--Construction Requirements.

907-804.03.6--Handling and Placing Concrete.

907-804.03.6.2--Consolidation. After the last sentence of Subsection 804.03.6.2 on page 864, add the following:

If the Department determines that there is an excessive number of projections, swells, ridges, depressions, waves, voids, holes, honeycombs or other defects in the completed structure, removal of the entire structure may be required as set out in Subsection 105.12.

907-804.03.15--Removal of Falsework, Forms, and Housing. Delete the first sentence of the second paragraph of Subsection 804.03.15 on page 871, and substitute the following:

Concrete in the last pour of a continuous superstructure shall have attained a compressive strength of 2,400 psi, as determined by cylinder tests or maturity meter probe, prior to striking any falsework.

Delete the first sentence of the third paragraph of Subsection 804.03.15 on page 871, and substitute the following:

At the Contractor's option and with the approval of the Engineer, the time for removal of forms may be determined by cylinder tests, in accordance with the requirements listed in Table 6, in which case the Contractor shall furnish facilities for testing the cylinders.

Delete the fourth and fifth paragraphs of Subsection 804.03.15 on pages 871 & 872, and substitute the following:

The cylinders shall be cured under conditions which are not more favorable than those existing for the portions of the structure which they represent.

Delete the table in Subsection 804.03.15 on page 872, and substitute the following:

Table 6
Minimum Compressive Strength Requirements for Form Removal

Forms:	
Columns	1000 psi
Side of Beams	1000 psi
Walls not under pressure	1000 psi
Floor Slabs, overhead	2000 psi
Floor Slabs, between beams	2000 psi
Slab Spans	2400 psi
Other Parts	1000 psi
Centering:	
Under Beams	2400 psi
Under Bent Caps	2000 psi
Limitation for Placing Beams on:	
Pile Bents, pile under beam	2000 psi
Frame Bents, two or more columns	2200 psi
Frame Bents, single column	2400 psi

In lieu of using concrete strength cylinders to determine when falsework, forms, and housings can be removed, an approved maturity meter may be used to determine concrete strengths by inserting probes into concrete placed in a structure. The minimum number of maturity meter probes required for each structural component shall be in accordance with Table 7. Falsework, forms, and housings may be removed when maturity meter readings indicate that the required concrete strength is achieved. Procedures for using the maturity meter and developing the strength/maturity relationship shall follow the requirements of AASHTO Designation: T 325 and ASTM Designation: C 1074 specifications. Technicians using the maturity meter or calculating strength/maturity graphs shall be required to have at least two hours of training prior to using the maturity equipment.

Table 7
Requirements for use of Maturity Meter Probes

Structure Component	Quantity of Concrete	No. of Probes
Slabs, beams, walls, & miscellaneous items	0 - 30 yd^3	2
	> 30 to 60 yd^3	3
	> 60 to 90 yd^3	4
	> 90 yd^3	5
Footings, Columns & Caps	0 - 13 yd^3	2
	> 13 yd^3	3
Pavement, Pavement Overlays	1200 yd^2	2
Pavement Repairs	Per repair or 900 yd^2 Whichever is smaller	2

907-804.03.16--Cold or Hot Weather Concreting.

907-804.03.16.1--Cold Weather Concreting. After the third paragraph of Subsection 804.03.16.1 on page 873, add the following:

In lieu of the protection and curing of concrete in cold weather, at the option of the Contractor with the approval of the Engineer, when concrete is placed during cold weather and there is a probability of ambient temperatures lower that 40°F, an approved maturity meter may be used to determine concrete strengths by inserting probes into concrete placed in a structure. The minimum number of maturity meter probes required for each structural component shall be in accordance with Table 7. An approved insulating blanketing material shall be used to protect the work when ambient temperatures are less than 40°F and shall remain in place until the required concrete strength in Table 6 is achieved. Procedures for using the maturity meter and developing the strength/maturity relationship shall follow the requirements of AASHTO Designation: T 325 and ASTM Designation: C 1074 specifications. Technicians using the maturity meter or calculating strength/maturity graphs shall be required to have at least two hours of training prior to using the maturity equipment.

Rename the Table in Subsection 804.03.16.1 on page 874 from "Table 6" to "Table 8".

907-804.03.19--Finishing Concrete Surfaces.

907-804.03.19.7--Finishing Bridge Floors.

907-804.03.19.7.4--Acceptance Procedure for Bridge Deck Smoothness. After the first sentence of the second paragraph of Subsection 804.03.19.7.4 on page 886, add the following:

Auxiliary lanes, tapers, shoulders and other areas that are not checked with the profilograph, shall meet a 1/8 inch in 10-foot straightedge check made transversely and longitudinally across the deck or slab.

907-804.05--Basis of Payment. Add the "907" prefix to the pay items listed on page 898.

SPECIAL PROVISION NO. 906-3

Training Special Provisions

This Training Special Provision supersedes subparagraph 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities," (Attachment 1), and is in implementation of 23 U.S.C. 140(a).

As part of the Contractor's equal employment opportunity affirmative action program training shall be provided as follows:

> The Contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

The number of trainees to be trained under this special provision will be as indicated in the bid schedule of the contract.

In the event that a Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the State highway agency for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the State highway agency and the Federal Highway Administration. The State highway agency and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore,

apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

SPECIAL PROVISION NO. 906-6

MISSISSIPPI DEPARTMENT OF TRANSPORTATION
ON-THE-JOB TRAINING PROGRAM

ALTERNATE TRAINING SPECIAL PROVISION

PURPOSE

The purpose of the On-The-Job Training (OJT) Program is to provide training for minority, female and economically disadvantaged individuals in order that they may develop marketable skills and gain journey status in the skilled craft classifications in which they are being trained.

INTRODUCTION

This voluntary OJT Program has been developed through the partnering efforts of the Road Builders of Mississippi, the Federal Highway Administration (FHWA) and the Mississippi Department of Transportation (MDOT).

The OJT Program has been designed for use by participating contractors and subcontractors in meeting their training needs. The objective of the OJT Program is to develop skilled workers in the skilled craft trade areas of highway construction who are sufficiently trained to be productive employees in the highway construction industry work force.

The success of the OJT Program will require that contractors and subcontractors take part in the program and follow uniform procedures in training and in tracking trainee's progress.

FUNDING

MDOT will establish an annual OJT Fund from which, contractors and subcontractors may bill the Department directly for hours worked by trainees. The funding source of this money will be state and federal funds for MDOT's OJT Program.

DISBURSEMENT OF FUNDS

MDOT will pay $3.00 per hour toward the trainee's salary for each hour of training performed by each trainee in an approved training program. Program reimbursements will be made directly to the prime or sub contractor. Requests for payment will be submitted to the Office of Civil Rights for approval.

Contractors must provide a signed invoice providing the following information to be reimbursed.

- Contractor's Name
- Mailing Address
- Trainee Name
- Social Security Number

- Race
- Sex
- Project Number
- Job Classification
- Total Number of Hours Completed

TRAINING PROGRAM APPROVAL

A. To use the OJT Program on highway construction projects, the contractor will notify the Department Office of Civil Rights using the On-the-Job Trainee Schedule Form. The notification must include the following information:

   - Trainee Starting Date
   - Project number (s) trainee starting on
   - Training program (classification) to be used; and
   - Number of Training Hours Required

B. If a contractor chooses to use a training program different from those listed in the OJT Program Manual, or desires to train in a different classification, the training program must be submitted in its entirety for approval by the Department and FHWA. The training proposal must include the following:

   1. The primary objective of the program: To provide training for minority, female and economically disadvantaged individuals for development to full journey status in the work classifications in which they are being trained.

   2. The minimum number of hours and type of training the trainee will receive as it relates to each specific task required to achieve journey status.

   3. No less than minimum wage.

   4. Trainee certification of completion.

   5. Records and reports submitted to the Office of Civil Rights on a monthly basis.

DEPARTMENT RESPONSIBILITY

1. Department project staff will monitor trainees on the project. They will monitor payrolls for payment of correct wage rates and fringe benefits. The Office of Civil Rights will maintain a master list by contractor name, project number, trainee name and trainee social security number to aid project staff in monitoring trainees who work on multiple projects.

2. The Office of Civil Rights may elect to interview trainees periodically during the training period to assess their performance and training program.

CONTRACTOR RESPONSIBILITY

1. Trainees must be identified on payrolls (i.e. dragline trainee).

2. When any trainee completes a program, or is terminated for a reason or reasons other than successful completion, the contractor must include the date of completion or an explanation for the termination and date of termination on the OJT Termination Report.

3. The contractor will assign each trainee to a particular person--either a supervisor or a journeyman/woman who is proficient in the craft the trainee is being trained in, to ensure that timely instructional experience is received by the trainee. This person, cooperating with the appropriate company personnel, will see that proper records and the total intended training hours are completed during the allocated number of hours set up in the classification criteria.

4. The contractor has the prerogative of terminating the training period of the trainee and advancing the trainee to journey status. Approval requests must be submitted to the Office of Civil Rights with an explanation (***refer to 2 above***).

5. Upon notification from the contractor, the Department will issue a skill verification card and certificate of training to the trainee.

6. Trainees may be transferred to state-aid highway construction projects in order to complete the training program. If transfers are made the Office of Civil Rights must be notified on the Monthly Trainee Form. All of the training hours completed by trainees will count toward overall program completion.

7. Program reimbursements will be made directly to the prime or sub contractor.

WAGE RATE

The wage rate for all trainees is the current Minimum Federal Wage Rate, during their OJT training program. Trainees shall be paid full fringe benefit amounts, where applicable. At the completion of the training program, the trainee shall receive the wages of a skilled journey.

RECRUITMENT AND SELECTION PROCEDURES

A. Prerequisites for Trainees

To be qualified for enrollment in the OJT Program, trainees must possess basic physical fitness for the work to be performed, dependability, willingness to learn and ability to follow instructions.

B. Licenses

Truck driver trainees must possess appropriate driver permits or licenses for the operation of Class A, B and C trucks. However, when an instructional permit is used in lieu of a license, the trainee must be accompanied by an operator who:

1. Holds a license corresponding to the vehicle being operated;

2. Has had at least one year of driving experience; and

3. Is occupying the seat next to the driver.

C. Recruitment

1. Notices and posters setting forth the contractor's Equal Employment Opportunity Policy and availability of training programs will be placed in areas readily accessible to employees, applicants for employment and potential employees.

2. The contractor must target minority, female or economically disadvantaged trainees.

3. The contractor will conduct systematic and direct recruitment through public and private employee referral sources. Contractors must submit the trainee's name and completed application form to the Office of Civil Rights for review and approval. Approval must be obtained before the trainee can begin work under the training program.

4. Present employees will be screened for upgrading.

D. Selection

1. The selection and employment of a person by participating contractor shall qualify the person for the OJT Program.

2. Selection will be made without regard to race, color, religion, sex, age or national origin and shall be completely nondiscriminatory.

3. Employment of trainees will be in accordance with the work force requirements of the contractor. Each contractor will hire and train the trainees for uses in their own organization.

4. Written certification of individuals under the category of economically disadvantaged can be provided to the contractor at the time of the interview. This certification must then be provided to the Office of Civil Rights with the other required information as part of the approval process for trainees.

- ***NOTE:*** The OJT Program is to provide training for minority, female and economically disadvantaged individuals in order that they may develop marketable skills and gain journey status in the skilled craft classifications in which they are being trained. However, this program does not exclude trainees that are not members of the above groups.

S E C T I O N 9 0 5 - P R O P O S A L

Date _____

Mississippi Transportation Commission
Jackson, Mississippi

Sirs: The following proposal is made on behalf of _____
_____ of _____
_____
for constructing the following designated project(s) within the time(s) hereinafter specified.

The plans are composed of drawings and blue prints on file in the offices of the Mississippi Department of Transportation, Jackson, Mississippi.

The Specifications are the current Standard Specifications of the Mississippi Department of Transportation approved by the Federal Highway Administration, except where superseded or amended by the plans, Special Provisions and Notice(s) to Bidders attached hereto and made a part thereof.

I (We) certify that I (we) possess a copy of said Standard and any Supplemental Specifications.

Evidence of my (our) authority to submit the Proposal is hereby furnished. The proposal is made without collusion on the part of any person, firm or corporation. I (We) certify that I (we) have carefully examined the Plans, the Specifications, including the Special Provisions and Notice(s) to Bidders, herein, and have personally examined the site of the work. On the basis of the Specifications, Special Provisions, Notice(s) to Bidders, and Plans, I (we) propose to furnish all necessary machinery, tools, apparatus and other means of construction and do all the work and furnish all the materials in the manner specified. I (We) understand that the quantities mentioned herein are approximate only and are subject to either increase or decrease, and hereby propose to perform any increased or decreased quantities of work at the unit prices bid, in accordance with the above.

Attached hereto is a certified check, cashier's check or Proposal Guaranty Bond in the amount as required in the Advertisement (or, by law).

INSTRUCTION TO BIDDERS: Alternate and Optional Items on Bid Schedule.

1. Two or more items entered opposite a single unit quantity WITHOUT DEFINITE DESIGNATION AS "ALTERNATE ITEMS" are considered as "OPTIONAL ITEMS". Bidders may or may not indicate on bids the Optional Item proposed to be furnished or performed WITHOUT PREJUDICE IN REGARD TO IRREGULARITY OF BIDS.

2. Items classified on the bid schedule as "ALTERNATE ITEMS" and/or "ALTERNATE TYPES OF CONSTRUCTION" must be preselected and indicated on bids. However, "Alternate Types of Construction" may include Optional Items to be treated as set out in Paragraph 1, above.

3. Optional items not preselected and indicated on the bid schedule MUST be designated in accordance with Subsection 102.06 prior to or at the time of execution of the contract.

4. Optional and Alternate items designated must be used throughout the project.

I (We) further propose to perform all "force account or extra work" that may be required of me (us) on the basis provided in the Specifications and to give such work my (our) personal attention in order to see that it is economically performed.

S E C T I O N 9 0 5 -- P R O P O S A L (CONTINUED)

I (We) further propose to execute the attached contract agreement (Section 902) as soon as the work is awarded to me (us), and to begin and complete the work within the time limit(s) provided for in the Specifications and Advertisement. I (We) also propose to execute the attached contract bond (Section 903) in an amount not less than one hundred (100) percent of the total of my (our) part, but also to guarantee the excellence of both workmanship and materials until the work is finally accepted.

I (We) enclose a certified check, cashier's check or bid bond for **five percent (5%) of total bid** and hereby agree that in case of my (our) failure to execute the contract and furnish bond within Ten (10) days after notice of award, the amount of this check (bid bond) will be forfeited to the State of Mississippi as liquidated damages arising out of my (our) failure to execute the contract as proposed. It is understood that in case I am (we are) not awarded the work, the check will be returned as provided in the Specifications.

Respectfully Submitted,

DATE _____

_____
Contractor

BY _____
Signature

TITLE _____

ADDRESS _____

CITY, STATE, ZIP _____

PHONE _____

FAX _____

E-MAIL _____

(To be filled in if a corporation)

Our corporation is chartered under the Laws of the State of _____ and the names, titles and business addresses of the executives are as follows:

_____
President Address

_____
Secretary Address

_____
Treasurer Address

The following is my (our) itemized proposal.

Construction of a Shop Building for the Materials Laboratory in Jackson, known as State Project Nos. BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302, in Hinds County.

I (We) agree to complete the entire project within the specified contract time.

***** SPECIAL NOTICE TO BIDDERS *****
BIDS WILL NOT BE CONSIDERED UNLESS BOTH UNIT PRICES AND ITEM TOTALS ARE ENTERED.
BIDS WILL NOT BE CONSIDERED UNLESS THE BID CERTIFICATION LOCATED AT THE END OF THE BID SHEETS IS SIGNED

*****BID SCHEDULE*****

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Item Amount	
						Dollar	Ct	Dollar	Ct
					Roadway Items				
0010	201-B001		2	Acre	Clearing and Grubbing				
0020	202-B005		2,830	Square Yard	Removal of Asphalt Pavement, All Depths Shop Building				
0030	202-B017		992	Linear Feet	Removal of Concrete Combination Curb & Gutter				
0040	202-B035		8	Square Yard	Removal of Concrete Sidewalk				
0050	202-B057		10	Each	Removal of Inlets, All Sizes				
0060	202-B070		10	Each	Removal of Sign Including Post & Footing				
0070	202-B086		42	Each	Removal of Guard Post				
0080	202-B106		308	Linear Feet	Removal of Pipe, All Sizes				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0090	202-B232		245	Linear Feet	Removal of Gravity Sewer Line, All Sizes, All Types				
0100	202-B233		1	Each	Removal of Gravity Sewer Manhole, All Sizes, All Types				
0110	202-B238		94	Linear Feet	Removal of Water Line, All Sizes, All Types				
0120	202-B259		2	Each	Removal of Water Meters, All Sizes				
0130	203-EX040	(E)	14,415	Cubic Yard	Borrow Excavation, AH, LVM, Class B9-6				
0140	203-G004	(E)	16,968	Cubic Yard	Excess Excavation, LVM, AH				
0150	206-A001	(S)	220	Cubic Yard	Structure Excavation				
0160	211-B001	(E)	40	Cubic Yard	Topsoil for Slope Treatment, Contractor Furnished				
0170	212-B001		1,399	Square Yard	Standard Ground Preparation				
0180	213-B001		1	Ton	Combination Fertilizer, 13-13-13				
0190	216-B004		1,399	Square Yard	Solid Sodding, Bermuda				
0200	219-A001		40	Thousand Gallon	Watering	20.	00	800.	00

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0210	233-C002		2	Ton	Straw Mulch, Class II				
0220	234-A001		1,250	Linear Feet	Temporary Silt Fence				
0230	235-A001		100	Bale	Temporary Erosion Checks				
0240	602-A001	(S)	106	Pounds	Reinforcing Steel				
0250	603-CA001	(S)	78	Linear Feet	15" Reinforced Concrete Pipe, Class III				
0260	603-CA002	(S)	87	Linear Feet	18" Reinforced Concrete Pipe, Class III				
0270	603-CA003	(S)	258	Linear Feet	24" Reinforced Concrete Pipe, Class III				
0280	603-CB002	(S)	1	Each	24" Reinforced Concrete End Section				
0290	603-SB039	(S)	1	Each	24" Branch Connections, Stub into Inlet				
0300	608-B001	(S)	187	Square Yard	Concrete Sidewalk, With Reinforcement				
0310	609-D001	(S)	1,017	Linear Feet	Combination Concrete Curb and Gutter Type 1				
0320	609-D002	(S)	175	Linear Feet	Combination Concrete Curb and Gutter Type 2				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0330	618-A001		1	Lump Sum	Maintenance of Traffic	XXXXXXXX	XXX		
0340	620-A001		1	Lump Sum	Mobilization	XXXXXXXX	XXX		
0350	907-230-A011		130	Each	Shrub Planting, Dwarf Yaupon Holly				
0360	907-230-A019		6	Each	Shrub Planting, Nellie R. Stevens Holly				
0370	907-230-A033		12	Each	Shrub Planting, Japanese Cleyera				
0380	907-230-A044		34	Each	Shrub Planting, Parsons Juniper				
0390	907-230-A045		66	Each	Shrub Planting, Clara Indian Hawthorn				
0400	907-230-B004		45	Each	Tree Planting, Burkii Eastern Red Cedar				
0410	907-230-B032		4	Each	Tree Planting, Sweetbay Magnolia				
0420	907-230-F001		319	Each	Shrub and Groundcover Planting, Big Blue Lily Grass Liriope				
0430	907-234-D001		7	Each	Inlet Siltation Guard				
0440	907-237-A002		500	Linear Feet	Wattles, 12"				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0450	907-242-PP001		1	Lump Sum	Water and Sewer Improvements, Per Plans	XXXXXXXX	XXX		
0460	907-242-PP003		1	Lump Sum	Construction of Shop Building	XXXXXXXX	XXX		
0470	907-246-A001		1,000	Linear Feet	Sandbags				
0480	907-246-B001		1,000	Linear Feet	Rockbags				
0490	907-258-PP016		23	Each	Bollard				
0500	907-282-A019		1	Lump Sum	Automatic Irrigation System	XXXXXXXX	XXX		
0510	907-307-C003	(M)	3,637	Square Yard	6" Soil-Lime-Water Mixing, Class C				
0520	907-307-D001		50	Ton	Lime				
0530	907-407-A001	(A2)	902	Gallon	Asphalt for Tack Coat				
0540	907-501-A003	(C)	187	Square Yard	9" Reinforced Cement Concrete Pavement, Broom Finish				
0550	907-601-B003	(S)	2	Cubic Yard	Class "B" Structural Concrete, Minor Structures				
0560	907-603-PP001		7	Each	Grate Inlet				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0570	907-607-B003		491	Linear Feet	Barrier Fence, Chain Link Wire, Per Plans				
0580	907-607-G006		1	Each	Gate, Barrier Fence, Per Plans				
0590	907-625-D001		50	Linear Feet	Traffic Stripe, Continuous Yellow, 4" Width				
0600	907-625-E001		1,251	Linear Feet	Detail Traffic Stripe, 4" Equivalent Length				
0610	907-625-E002		197	Linear Feet	Detail Traffic Stripe, Blue-ADA				
0620	907-625-F002		180	Linear Feet	Legend, 4" Equivalent Length				
0630	907-625-F003		18	Square Feet	Legend, Blue-ADA				
0640	907-699-A002		1	Lump Sum	Roadway Construction Stakes	XXXXXXXX	XXX		
					ALTERNATE GROUP AA NUMBER 1				
0650	907-403-A012	(BA1)	1,296	Ton	Hot Mix Asphalt, ST, 19-mm mixture				
0660	907-403-A015	(BA1)	348	Ton	Hot Mix Asphalt, ST, 9.5-mm mixture				
					ALTERNATE GROUP AA NUMBER 2				
0670	907-403-M001	(BA1)	348	Ton	Warm Mix Asphalt, ST, 9.5-mm mixture				

Line No.	Item Code	Adj Code	Quantity	Units	Description	Unit Price		Bid Amount	
0680	907-403-M004	(BA1)	1,296	Ton	Warm Mix Asphalt, ST, 19-mm mixture				

*** BID CERTIFICATION ***

TOTAL BID.....$_____

*** SIGNATURE STATEMENT ***

BIDDER ACKNOWLEDGES THAT HE/SHE HAS CHECKED ALL ITEMS IN THIS PROPOSAL FOR ACCURACY AND CERTIFIED THAT THE FIGURES SHOWN THEREIN CONSTITUTE THEIR OFFICIAL BID.

_____

BIDDER'S SIGNATURE

_____

BIDDER'S COMPANY

_____

BIDDER'S FEDERAL TAX ID NUMBER

CONDITIONS FOR COMBINATION BID

If a bidder elects to submit a combined bid for two or more of the contracts listed for this month's letting, the bidder must complete and execute these sheets of the proposal in each of the individual proposals to constitute a combination bid. In addition to this requirement, each individual contract shall be completed, executed and submitted in the usual specified manner.

Failure to execute this Combination Bid Proposal in each of the contracts combined will be just cause for each proposal to be received and evaluated as a separate bid.

* * * *

SECTION 905 - COMBINATION BID PROPOSAL (Continued)

Project Number	Pay Item Number	Unit	Unit Price Reduction	Total Item Reduction	Total Contract Reduction
1. _____	_____ _____	_____ _____	_____ _____	_____ _____	
2. _____	_____ _____	_____ _____	_____ _____	_____ _____	
3. _____	_____ _____	_____ _____	_____ _____	_____ _____	
4. _____	_____ _____	_____ _____	_____ _____	_____ _____	
5. _____	_____ _____	_____ _____	_____ _____	_____ _____	
6. _____	_____ _____	_____ _____	_____ _____	_____ _____	
7. _____	_____ _____	_____ _____	_____ _____	_____ _____	
8. _____	_____ _____	_____ _____	_____ _____	_____ _____	

Project Number	Pay Item Number	Unit	Unit Price Reduction	Total Item Reduction	Total Contract Reduction
9. _____	_____ _____	_____ _____	_____ _____	_____ _____	
10. _____	_____ _____	_____ _____	_____ _____	_____ _____	

C. If option (c) has been selected, then initial and complete one of the following, go to II. and sign Combination Bid Proposal.

_____ I (We) desire to be awarded work not to exceed a total monetary value of $ _____.

_____ I (We) desire to be awarded work not to exceed _____ number of contracts.

II. It is understood that the Mississippi Transportation Commission not only reserves the right to reject any and all proposals, but also the right to award contracts upon the basis of lowest separate bids or combination bids most advantageous to the State.

It is further understood and agreed that the Combination Bid Proposal is for comparison of bids only and that each contract shall operate in every respect as a separate contract in accordance with its proposal and contract documents.

I (We), the undersigned, agree to complete each contract on or before its specified completion date.

SIGNED _____

_____

_____

TO: EXECUTIVE DIRECTOR, MISSISSIPPI DEPARTMENT OF TRANSPORTATION
JACKSON, MISSISSIPPI

CERTIFICATE

If awarded this contract, I (we) contemplate that portions of the contract will be sublet. I (we) certify that those subcontracts which are equal to or in excess of fifty thousand dollars ($50,000.00) will be in accordance with regulations promulgated and adopted by the Mississippi State Board of Contractors on January 13, 1999.

I (we) agree that this notification of intent DOES NOT constitute APPROVAL of the subcontracts.

NOTE: Insert name and address of subcontractors. (Subcontracts equal to or in excess of fifty thousand dollars ($50,000.00) ONLY.)

_____	_____
(Individual or Firm)	(Address)
_____	_____
(Individual or Firm)	(Address)
_____	_____
(Individual or Firm)	(Address)
_____	_____
(Individual or Firm)	(Address)

NOTE: Failure to complete the above DOES NOT preclude subsequent subcontracts. Subsequent subcontracts, if any, equal to or in excess of fifty thousand dollars ($50,000.00) will be in accordance with regulations promulgated and adopted by the Mississippi State Board of Contractors on January 13, 1999.

Contractor _____

By _____

Title _____

CERTIFICATE MUST BE EXECUTED

REV. 2/99

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

CERTIFICATION
(Execute in duplicate)

I,_____,
(Name of person signing certification)

individually, and in my capacity as _____ of
(Title)

_____ do hereby certify under
(Name of Firm, Partnership, or Corporation)

penalty of perjury under the laws of the United States and the State of Mississippi that

_____, Bidder
(Name of Firm, Partnership, or Corporation)

on Project No. **BWO-9718-25(001)/502350301 & LWO-9023-25(002)/502350302**,

in **Hinds** County(ies), Mississippi, has not either directly or indirectly entered into any agreement, participated in any collusion; or otherwise taken any action in restraint of free competitive bidding in connection with this contract; nor have any of its corporate officers or principal owners.

Except as noted hereafter, it is further certified that said legal entity and its corporate officers, principal owners, managers, auditors and others in a position of administering federal funds are not currently under suspension, debarment, voluntary exclusion or determination of ineligibility; nor have a debarment pending; nor been suspended, debarred, voluntarily excluded or determined ineligible within the past three years by the Mississippi Transportation Commission, the State of Mississippi, any other State or a federal agency; nor been indicted, convicted or had a civil judgment rendered by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three years.

Initial here "_____" if exceptions are attached and made a part thereof. Any exceptions shall address to whom it applies, initiating agency and dates of such action.

Note: Exceptions will not necessarily result in denial of award but will be considered in determining bidder responsibility. Providing false information may result in criminal prosecution or administrative sanctions.

All of the foregoing and attachments (when indicated) is true and correct.

Executed on _____ _____
Signature

(5/29/2008S)

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

CERTIFICATION
(Execute in duplicate)

I,_____,
(Name of person signing certification)

individually, and in my capacity as _____ of
(Title)

_____ do hereby certify under
(Name of Firm, Partnership, or Corporation)

penalty of perjury under the laws of the United States and the State of Mississippi that

_____, Bidder
(Name of Firm, Partnership, or Corporation)

on Project No. **BWO-9718-25(001)/502350301 & LWO-9023-25(002)/502350302**,

in **Hinds** County(ies), Mississippi, has not either directly or indirectly entered into any agreement, participated in any collusion; or otherwise taken any action in restraint of free competitive bidding in connection with this contract; nor have any of its corporate officers or principal owners.

Except as noted hereafter, it is further certified that said legal entity and its corporate officers, principal owners, managers, auditors and others in a position of administering federal funds are not currently under suspension, debarment, voluntary exclusion or determination of ineligibility; nor have a debarment pending; nor been suspended, debarred, voluntarily excluded or determined ineligible within the past three years by the Mississippi Transportation Commission, the State of Mississippi, any other State or a federal agency; nor been indicted, convicted or had a civil judgment rendered by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three years.

Initial here "_____" if exceptions are attached and made a part thereof. Any exceptions shall address to whom it applies, initiating agency and dates of such action.

Note: Exceptions will not necessarily result in denial of award but will be considered in determining bidder responsibility. Providing false information may result in criminal prosecution or administrative sanctions.

All of the foregoing and attachments (when indicated) is true and correct.

Executed on _____ _____
Signature

(5/29/2008S)

S E C T I O N 9 0 2

CONTRACT FOR **BWO-9718-25(001)/502350301 & LWO-9023-25(002)/502350302**

LOCATED IN THE COUNTY(IES) OF **Hinds**

STATE OF MISSISSIPPI,

COUNTY OF HINDS

This contract entered into by and between the Mississippi Transportation Commission on one hand, and the undersigned contractor, on the other witnesseth;

That, in consideration of the payment by the Mississippi Transportation Commission of the prices set out in the proposal hereto attached, to the undersigned contractor, such payment to be made in the manner and at the time of times specified in the specifications and the special provisions, if any, the undersigned contractor hereby agrees to accept the prices stated in the proposal in full compensation for the furnishing of all materials and equipment and the executing of all the work contemplated in this contract.

It is understood and agreed that the advertising according to law, the Advertisement, the instructions to bidders, the proposal for the contract, the specifications, the revisions of the specifications, the special provisions, and also the plans for the work herein contemplated, said plans showing more particularly the details of the work to be done, shall be held to be, and are hereby made a part of this contract by specific reference thereto and with like effect as if each and all of said instruments had been set out fully herein in words and figures.

It is further agreed that for the same consideration the undersigned contractor shall be responsible for all loss or damage arising out of the nature of the work aforesaid; or from the action of the elements and unforeseen obstructions or difficulties which may be encountered in the prosecution of the same and for all risks of every description connected with the work, exceptions being those specifically set out in the contract; and for faithfully completing the whole work in good and workmanlike manner according to the approved Plans, Specifications, Special Provisions, Notice(s) to Bidders and requirements of the Mississippi Department of Transportation.

It is further agreed that the work shall be done under the direct supervision and to the complete satisfaction of the Executive Director of the Mississippi Department of Transportation, or his authorized representatives, and when Federal Funds are involved subject to inspection at all times and approval by the Federal Highway Administration, or its agents as the case may be, or the agents of any other Agency whose funds are involved in accordance with those Acts of the Legislature of the State of Mississippi approved by the Governor and such rules and regulations issued pursuant thereto by the Mississippi Transportation Commission and the authorized Federal Agencies.

The Contractor agrees that all labor as outlined in the Special Provisions may be secured from list furnished by

It is agreed and understood that 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 this contract shall be read and enforced as though it were included herein, and, if through mere mistake or otherwise any such provision is not inserted, then upon the application of either party hereto, the contract shall forthwith be physically amended to make such insertion.

The Contractor agrees that he has read each and every clause of this Contract, and fully understands the meaning of same and that he will comply with all the terms, covenants and agreements therein set forth.

Witness our signatures this the _____ day of _____, _____.

_____

Contractor (s)

By _____ MISSISSIPPI TRANSPORTATION COMMISSION

Title _____ By _____

Signed and sealed in the presence of: Executive Director

(names and addresses of witnesses)

_____ _____

Secretary to the Commission

Award authorized by the Mississippi Transportation Commission in session on the ____ day of _____, _____, Minute Book No. _____, Page No. _____.

Revised 8/06/2003

S E C T I O N 9 0 3
PERFORMANCE AND PAYMENT BOND

CONTRACT BOND FOR: **BWO-9718-25(001)/502350301 & LWO-9023-25(002)/502350302**

LOCATED IN THE COUNTY(IES) OF: **Hinds**

STATE OF MISSISSIPPI,

COUNTY OF HINDS

Know all men by these presents: that we, _____
(Contractor)

_____ Principal, a _____

residing at _____ in the State of _____

and _____
(Surety)

residing at _____ in the State of _____,

authorized to do business in the State of Mississippi, under the laws thereof, as surety, are held and firmly bound unto the State of Mississippi in the sum of _____

_____

($_____) Dollars, lawful money of the United States of America, to be paid to it for which payment well and truly to be made, we bind ourselves, our heirs, administrators, successors, or assigns jointly and severally by these presents.

Signed and sealed this the _____ day of _____ A.D. _____.

The conditions of this bond are such, that whereas the said _____

_____

principal, has (have) entered into a contract with the Mississippi Transportation Commission, bearing the date of _____ day of _____ A.D. _____ hereto annexed, for the construction of certain projects(s) in the State of Mississippi as mentioned in said contract in accordance with the Contract Documents therefor, on file in the offices of the Mississippi Department of Transportation, Jackson, Mississippi.

Now therefore, if the above bounden _____

_____ in all things shall stand to and abide by and well and truly observe, do keep and perform all and singular the terms, covenants, conditions, guarantees and agreements in said contract, contained on his (their) part to be observed, done, kept and performed and each of them, at the time and in the manner and form and furnish all of the material and equipment specified in said contract in strict accordance with the terms of said contract which said plans, specifications and special provisions are included in and form a part of said contract and shall maintain the said work contemplated until its final completion and acceptance as specified in Subsection 109.11 of the approved specifications, and save harmless said Mississippi Transportation Commission from any loss or damage arising out of or occasioned by the negligence, wrongful or criminal act, overcharge, fraud, or any other loss or damage whatsoever, on the part of said principal (s), his (their) agents, servants, or employees in

the performance of said work or in any manner connected therewith, and shall be liable and responsible in a civil action instituted by the State at the instance of the Mississippi Transportation Commission or any officer of the State authorized in such cases, for double any amount in money or property, the State may lose or be overcharged or otherwise defrauded of, by reason of wrongful or criminal act, if any, of the Contractor(s), his (their) agents or employees, and shall promptly pay the said agents, servants and employees and all persons furnishing labor, material, equipment or supplies therefor, including premiums incurred, for Surety Bonds, Liability Insurance, and Workmen's Compensation Insurance; with the additional obligation that such Contractor shall promptly make payment of all taxes, licenses, assessments, contributions, damages, any liquidated damages which may arise prior to any termination of said principal's contract, any liquidated damages which may arise after termination of the said principal's contract due to default on the part of said principal, penalties and interest thereon, when and as the same may be due this state, or any county, municipality, board, department, commission or political subdivision: in the course of the performance of said work and in accordance with Sections 31-5-51 et seq. Mississippi Code of 1972, and other State statutes applicable thereto, and shall carry out to the letter and to the satisfaction of the Executive Director of the Mississippi Department of Transportation, all, each and every one of the stipulations, obligations, conditions, covenants and agreements and terms of said contract in accordance with the terms thereof and all of the expense and cost and attorney's fee that may be incurred in the enforcement of the performance of said contract, or in the enforcement of the conditions and obligations of this bond, then this obligation shall be null and void, otherwise to be and remain in full force and virtue.

Witness our signatures and seals this the _____ day of _____ A.D. _____.

_____	_____
(Contractors) Principal	Surety
By _____	By _____
	(Signature) Attorney in Fact
	Address _____
	_____
Title _____	_____
(Contractor's Seal)	(Printed) MS Agent
	_____
	(Signature) MS Agent
	Address _____
	_____
	_____
	(Surety Seal)
	_____
	Mississippi Insurance ID Number

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____
Contractor

_____
Address

_____
City, State ZIP

as Principal, hereinafter called the Principal, and _____
Surety

a corporation duly organized under the laws of the state of _____

as Surety, hereinafter called the Surety, are held and firmly bound unto **State of Mississippi, Jackson, Mississippi**

As Obligee, hereinafter called Obligee, in the sum of **Five Per Cent (5%) of Amount Bid**

Dollars ($ _____)

for the payment of which sum will and truly to be made, the said Principal and said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for **Construction of a Shop Building for the Materials Laboratory in Jackson, known as State Project Nos. BWO-9718-25(001) / 502350301 & LWO-9023-25(002) / 502350302, in Hinds County.**

NOW THEREFORE, the condition of this obligation is such that if the aforesaid Principal shall be awarded the contract, the said Principal will, within the time required, enter into a formal contract and give a good and sufficient bond to secure the performance of the terms and conditions of the contract, then this obligation to be void; otherwise the Principal and Surety will pay unto the Obligee the difference in money between the amount of the bid of the said Principal and the amount for which the Obligee legally contracts with another party to perform the work if the latter amount be in excess of the former, but in no event shall liability hereunder exceed the penal sum hereof.

Signed and sealed this _____ day of _____ , 20___

_____
(Principal) (Seal)

_____ By: _____
(Witness) (Name) (Title)

_____
(Surety) (Seal)

_____ By: _____
(Witness) (Attorney-in-Fact)

_____
MS Agent

_____
Mississippi Insurance ID Number